Ontario

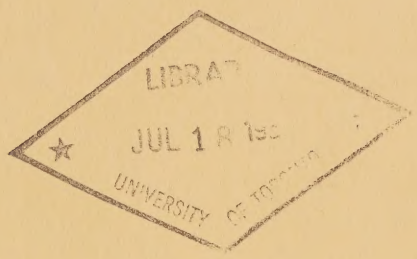
THE REPORT OF THE

Royal Commission on Electric Power Planning

Chairman: Arthur Porter

VOLUME 7

The Socio-Economic and Land-Use Impacts of Electric Power in Ontario



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February 1980

Published by the Royal Commission on Electric Power Planning
Printed by J.C. Thatcher, Queen's Printer of Ontario

ISBN: The Report (9 volumes): 0-7743-4672-8
ISBN: Volume 7: 0-7743-4669-8

Design and production management: Ken Slater
Photocomposition: Shirley Berch
Text management and photocomposition facilities: Alphatext Limited

Graphics: Acorn Technical Art

Editors: T.C. Fairley & Associates; R.A. Grundy & Associates

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List of Volumes

The Report of the Royal Commission on Electric Power Planning is comprised of the following volumes:

Volume 1: Concepts, Conclusions, and Recommendations

Volume 2: The Electric Power System in Ontario

Volume 3: Factors Affecting the Demand for Electricity in Ontario

Volume 4: Energy Supply and Technology for Ontario

Volume 5: Economic Considerations in the Planning of Electric Power in Ontario

Volume 6: Environmental and Health Implications of Electric Energy in Ontario

Volume 7: The Socio-Economic and Land-Use Impacts of Electric Power in Ontario

Volume 8: Decision-Making, Regulation, and Public Participation: A Framework for Electric Power Planning in Ontario for the 1980s

Volume 9: A Bibliography to the Report

VOLUME 7

The Socio-Economic and Land-Use Impacts of Electric Power in Ontario

Rodger Schwass

The Author

Since 1976, RODGER SCHWASS has been Dean of the Faculty of Environmental Studies at York University. Between 1969 and 1976, he was vice-president, economics and planning, Acres Consulting Services, and responsible for a wide variety of economics and planning studies. Between 1965 and 1969, he founded and developed the eastern Canada office of Hedlin Menzies & Associates, a firm of economists and policy analysts. One of his assignments was to supervise a two-year study of Ontario agriculture. Out of this study emerged many of the policy initiatives that were taken by the Ontario government during the early 1970s in the food industry.

Author's Acknowledgements

For their assistance in preparing key sections, the author is indebted to Mr. Chris Haussmann and to Mrs. Betsy Faulkner; for general research assistance he wants to thank Mrs. Lyse Morisset-Blais and Mrs. Mary Ouchterlony.

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Foreword

The Commission wishes to acknowledge the contributions to our Report made by the author of this volume. The enormity of the task as well as the skill and tenacity with which it was performed are testimony to the talents of Rodger Schwass. Our work would have been immeasurably more difficult without his assistance.

This volume, *The Socio-Economic and Land-Use Impacts of Electric Power in Ontario*, focuses on a key issue area raised by the public during the Commission's public hearings process. The analysis, conclusions, and recommendations reflect data received by the Commission in the form of public testimony and exhibits, consultants' reports, and independent research and analysis by the author. We have relied heavily on this work in formulating our own conclusions and recommendations in Volume 1. However, the views expressed in this volume are ultimately the responsibility of the author. This document is therefore best viewed as a background paper which attempts to draw together the detailed evidence and analysis available on this complex subject, in a fashion which will be of use to the general public as well as to the technical community.

The research and evolution of this document were directed and reviewed for the Commission by Philip A. Lapp and Peter G. Mueller.

Arthur Porter, Chairman

Executive Summary

World population will double by early in the next century. Nine-tenths of the growth will take place in the Third World. To provide jobs will require massive increases in investment and in energy supplies. Energy self-reliance must therefore be a primary goal of all countries. This will require a reworking of industrial priorities, favouring techniques and systems that conserve and recycle resources. Advanced countries may have to accept somewhat lower standards of living. Canada must, at the very least, constrain its use of oil and promote greater use of natural gas, coal, electricity, and biomass until a transition to entirely new energy sources is possible.

Canada is extremely vulnerable to the environment. The climate is harsh. Nine-tenths of the country is sparsely inhabited and of low productivity. The population is highly urbanized. Transportation and communications are expensive. Energy and food must be stored for half the year. Land is becoming scarce. Energy consumption per capita is the highest in the world.

More than half of Canada's foodland is within 80 km of the 19 largest cities. Even with rising food prices, farmers cannot compete with urban buyers for the best land. About 2 million additional acres of the most valuable foodland will be converted to urban use by the year 2000 unless steps are taken to prevent it.

Energy conservation has not been pressed with sufficient vigour by the Ontario government. New technologies and higher energy prices will be needed to constrain demand. Energy is invisible; consumers do not know how much they are using. All products should carry an energy-efficiency label. Low energy options should be made available to consumers of transportation services, home heating systems, and appliances. Regulation will be needed to require manufacturers to attach such labels and to manufacture more efficient products. More government support is needed to encourage conservation investments by both businessmen and private citizens. The energy industry itself must be persuaded to co-operate.

Ontario has been urbanizing rapidly since World War 2. During this period, the provincial government assumed a leading role in planning the provincial economy, and the responsibility of local governments was reduced. Reaction to this state of affairs by local citizens and governments has brought a partial devolution of powers to the municipalities, within guidelines established by the province. At the same time, strong new legislation has been enacted in the environmental and planning fields. The conflict has in part been dealt with by a more open planning system in which local citizens and groups can have a voice.

Ontario's growth is now expected to slow down, reflecting a lower birth rate and a lower level of net immigration. This will reduce the rate of industrial growth and new job creation. It may increase stresses in low-growth areas of the province, especially if people continue to move to the cities.

Ontario Hydro's role is to produce electricity at the lowest possible cost. It has not been pressed by the government to create jobs in depressed areas. At the same time, the availability of abundant power, at rates lower than in the U.S., is expected to create jobs.

Ontario Hydro's budget is about 25 per cent of that of the Ontario government. It employs 28,000, and indirectly, through subcontractors, it generates a further 25,000 jobs in Ontario. Salaries are higher than in most other organizations. Hydro therefore has an enormous impact on many communities.

This impact is especially strong when Hydro develops an energy centre in a rural area such as Nanticoke or Bruce. At Bruce, the arrival of a labour force of 8,500 for an extended period has had great social and economic impact. Port Elgin and Kincardine have both grown from 2,000 to about 6,000, and studies predict that they will fall back to 4,000 at the end of the project. Long-term investments have been made in public services and private businesses. Hydro does not appear to have planned any measures to mitigate the effect that the completion of construction in 1985 will have on the two communities. Despite the availability of power, there seems little likelihood of attracting enough industry to overcome this effect.

Between 1951 and 1976, the population on Ontario farms fell from 702,000 to 341,000, while the provincial population grew from 4.5 to 8.3 million. The number of farms fell from 150,000 to 89,000 and the average capital value of farms increased from $17,000 to $209,000. Farmland rose in value from a few hundred dollars to as much as several thousand dollars per acre. Nevertheless, the farm value of

crops reached only $163 per acre in 1977. Farmers remain the weakest claimants on rural land, especially when roads are snow-ploughed and the land is suited to urban housing. The result is that nearly half of the lots created in Ontario each year are the result of rural severances in foodland.

While Canada has 169 million acres of foodland, Ontario has just 15 million acres. But Ontario has nearly one-half of Canada's 10 million acres of Class 1 cropland and produces 30 per cent of Canada's domestic food output. Once able to pay for food imports with export sales of food, Ontario is moving farther and farther away from self-sufficiency. The remaining foodland must be safeguarded. The Ontario Ministry of Agriculture and Food has a Food Lands Development Branch that has formulated guidelines for the use of foodlands by ministries of government, municipalities, and the private sector. Nevertheless, even stronger legislative protection appears to be needed if further loss of foodland is to be avoided, especially in the Niagara and Toronto regions.

Ontario Hydro's bulk transmission system traverses a distance of about 12,000 miles and its rights of way cover about 200,000 acres of land. However, the land under the towers can be cultivated if it is arable, with the exception of the land occupied by towers. Hydro estimates the area of this land to be not more than 3,000 acres. Nevertheless, Hydro has been under strong attack by farmers and environmentalists for its land-use and land-acquisition policies.

Ontario Hydro has worked closely with public interest groups to classify and rank Ontario foodlands that should be avoided in the future in the routing of lines. In addition, new procedures for negotiating easements and purchases, and for ensuring that farm operations are not obstructed, seem to have resolved some of the farmer-Hydro issues. Rural residents on small lots near proposed power lines remain opposed to them, apparently on aesthetic grounds. The strength of their views is underlined by studies that show a 29 per cent loss of value in rural estates that are near power lines.

Air pollution effects on crops appear to be mounting in western Ontario. Coal-fired power stations could add significantly to airborne pollutants and should not be sited anywhere in western Ontario.

Also, Ontario Hydro facilities should only be located in areas of low agricultural capability, or where lines pass over as little foodland as possible, or on land irreversibly transferred to urban use, when urban developments are being moved away from foodland, or on multiple-use corridors already severed from agriculture.

The Ontario food industry is highly dependent on reliable supplies of all forms of energy. It is very important that an energy conservation programme be developed for the food industry, including agriculture, to promote higher output per acre with less energy. Waste heat from a variety of sources, but particularly from nuclear plants, may be valuable for greenhouse production and for fish-farming.

Ontario Hydro now has sites available for the production of an additional 52 MW of power, or triple the present demand in Ontario. Hydro already has a reserve of 40 per cent, so the acquisition of further property seems unnecessary.

CHAPTER ONE

Introduction

> We are not only concerned with "Ontario space", but inevitably with "global space", and not only with today and tomorrow and next year, but also with a century or a millennium hence.[1]

Socio-economic and land-use issues have been interpreted by the RCEPP in the broadest sense. The Commission has taken the view that decision-making related to agriculture, housing, electric power facilities, and industrial growth must be undertaken in a framework that recognizes the universal need for electric power, and that the provision of power will have effects on people, on the economy, and on land use.

The Commission recognizes that, while it is possible to quantify some socio-economic and land-use impacts, others are impossible to "prove" with statistics.

While cities were originally built on the best land, their expansion now clearly threatens the very basis of food production on which they depend. This issue is central to all planning for the future.

Strong economic activity is possible only when readily usable energy is provided. Technology and abundant resources have made possible an era of "cheap" energy, which has changed the nature of work itself and the character of land use in Ontario.

Energy and food are synonymous. Only with increasing amounts of fertilizers, gasoline, oil, and electricity can more food be produced from the existing land base. All of these resources are in finite supply and are non-renewable. Their conservation is one of the most important economic and ethical issues facing industrial societies around the world.

Electric power planning in Ontario affects both land-use and water-use planning. The vast amount of cooling water needed for power plants dictates their positioning on the Great Lakes. Finding such sites creates a need for long power lines over farmland. The only alternative would be inland sites, where costly cooling towers would be needed, presenting serious environmental difficulties.

Some submissions to the RCEPP suggested that industrial parks could be developed in non-agricultural areas adjacent to power plants, far from foodland and from the Great Lakes.

Some of the key questions and issues that were raised by the public before the RCEPP were:

Is suitable land available for the siting of future power stations and transmission corridors?

What new alternative technologies might become available? What land-use implications would be raised by their use?

To what extent are communities affected by proximity to large construction projects, for which they must first expand and then retrench? Are communities provided with enough information to help them cushion such impacts? Is multi-purpose, industrial use of adjacent lands provided for, to assist them with the transition?

What growth can be expected to take place in urban and rural Ontario during the next 30 years? Will this growth place serious pressure on available foodland? Are farm organizations, communities, and individuals provided with sufficient information to allow them to take part in a democratic process of decision-making?

To what extent is land capability degraded or enhanced by electric power developments?

How adequate is the existing land inventory?

Can waste heat from electric power generation be used for food production?

Can or should Ontario Hydro build future power plants in areas of low-quality farmland, avoiding the Niagara fruitlands and the rich foodlands of western Ontario?

How can social, environmental, ethical, and aesthetic factors be combined with economic factors in land-use planning?

What regulatory processes should be set up to limit the loss of Class 1 and Class 2 agricultural land? Should housing densities be regulated? Is it possible to create corridors that might include power lines, pipelines, highways, and recreational areas?

How can information gathered by Ontario Hydro be presented in a form usable by other planning

agencies and ministries? What energy-related research should be conducted by the various ministries? To what extent should further research be contracted out? Who should co-ordinate this work?

To what extent will Ontario Hydro power stations and transmission lines require further use of high-quality farmland? What is the role of the Environmental Assessment Act and the Planning Act?

To what extent are provincial ministries and municipal officials involved in Ontario Hydro's overall land-use planning strategy? Do they have any actual effect on Ontario Hydro's plans? What mechanisms might best incorporate local, regional, and provincial concerns into power-system planning?

To what extent can routing of lines minimize use of foodland without increasing costs? Can the impact be minimized by good planning?

Do extra-high-voltage lines create health, environmental, and economic threats to the farm community? What are the land-use implications of underground cables? Would they be more acceptable to the farming community?

The Evidence

Among the most active and eloquent participants in the work of the RCEPP have been the representatives of the rural community: farm organizations, rural spokesmen, and individuals. They represented, strongly and sincerely, the viewpoints of the 4 per cent of Ontario residents who are actively engaged in farming, and perhaps another 20 per cent who live and work in the countryside or who own second homes in the country or in small municipalities.

Their testimony focused on the steadily disappearing stock of farmland, the prospect of reduced food self-sufficiency, the high value of land in the hands of competitive and independent farmers, the failure of the province to develop an adequate land-use policy, and the unwillingness of Ontario Hydro to work closely with ministries, municipalities, and individuals in the search for alternative sites and routes that would minimize socio-economic and land-use impacts in rural Ontario. There was strong support for multi-use corridors over marginal lands, unsuited for food production; for locating power plants closer to demand centres (cities); and for energy centres that would generate jobs in outlying areas where foodland would not be affected.

At the same time, evidence was presented showing that the growth of electrical supply is perhaps more essential to food production than to any other industry. Electricity still represents the most flexible energy source available to farmers and one whose reliability and availability must not be jeopardized.

CHAPTER TWO

Global Socio-Economic Trends

Population

In the advanced countries, it is easy to view the world's rapidly growing population in simple terms, attributing many of the world's problems to soaring birth rates in the poor countries. Some poor countries have resisted the introduction of population control programmes even though they appear essential to the achievement of development objectives. Some parts of the Third World are not overpopulated, but in others people choose to have six or seven children knowing that all but one or two will die. It can also be argued that we in the developed countries have too many people, demanding too many goods, since we consume nearly two-thirds of the world's currently available resources.

The world's population will double by early in the next century. The 1970s have seen the greatest growth of population in human history, with more than 600,000 per month or 800 million during the decade being added to world population. Over 88 per cent of future population growth will be in the Third World. This will place heavy pressure on the social and economic systems of the poor countries. The doubling of the Third World's population will require a doubling of investments in social and physical infrastructure in those countries simply to retain existing standards of living. A doubling of population calls for a trebling of jobs.

Table 2.1 Projections of Total Populations in Selected Countries, 1970-85, if Current Fertility Levels Continue

	1970 mid-year (millions)	1985 mid-year (millions)	Growth 1970-85 (%)
People's Republic of China	775.1	1,114.0	43.7
India	554.8	849.4	53.2
Soviet Union	242.8	283.0	16.6
United States	204.9	235.7	15.0
Indonesia	121.2	194.0	60.0
Japan	103.7	119.8	15.5
Brazil	93.7	149.8	60.0
Bangladesh	73.7	120.2	63.1
Federal Republic of Germany	60.6	64.0	5.6
Pakistan	59.0	96.3	63.2
United Kingdom	55.6	60.8	9.4
Nigeria	55.1	84.7	53.8
Italy	54.3	58.6	8.0
Mexico	50.7	87.4	72.4
France	50.0	56.3	12.6
Philippines	38.1	65.5	71.8
Thailand	36.2	60.9	68.5
Turkey	35.6	55.6	56.4
Egypt	33.9	53.4	57.7
Spain	33.2	38.1	14.5
South Korea	32.5	51.2	57.6
Poland	32.3	37.2	15.0
Iran	28.4	47.7	68.2
Burma	27.7	40.0	44.2
Ethiopia	25.0	35.7	42.7
Argentina	24.4	30.4	24.9
Canada	21.3	25.2	18.3
Ontario	7.5	9.1	21.3

Source: United States projections based on United Nations data.

No one knows when world population growth will slow down. Demographers now believe that a gradual slowing in population growth will begin during the second decade of the next century, and that world population will stabilize in the region of 12 to 20 billions by about 2050 (see Figure 2.1).

Fig. 2.1: p. 6

The key to this stabilization is clearly the development of a more satisfactory life-style for the 90 per cent of the world's population who will remain poor. This life-style must provide some alleviation of

poverty, such as better housing, adequate food supplies, education, and medical care, and the opportunity for gainful employment.

To accomplish such a revolution on the scale required to obviate global conflicts between the developing and developed world, and to stabilize world population, the world must usher in a new international economic order (NIEO). First conceived and developed by Third World countries themselves, in several international conferences, the NIEO would allow the Third World countries to move from the position of passive aid-recipients to that of active partners with the developed countries.

The NIEO calls for the developed and the developing countries to work out the details of new forms of co-operation for industrial development. Industry is recognized as a dynamic instrument of growth, essential to the rapid economic and social development of all countries. The United Nations has declared its firm intention to promote industrial development at all levels and has called on the developing countries to create the conditions necessary for industrial growth.

The most serious consequence of the NIEO would be a dramatically expanded demand for energy in the less developed nations, to power industry and commerce and improve housing. What we call "development" usually means the displacement of people by capital equipment. Any kind of technology must be supplied with energy and essential resources. The change in availability, location, and cost of various raw materials and energy resources may be so great that even the concept of "developed" or "underdeveloped" countries may have to change.

The question is whether the world, even by providing higher and higher prices for essential resources, can find enough resources and energy to fuel a massive increase in per capita income in the Third World, while population trebles. Economies that are dependent on foreign supplies of crucial raw materials, and especially fuels, to maintain their growth, and that are subject to overnight changes in the terms of trade or even the cutting off of supplies, cannot be said to be "developed". Those countries which supply the stocks of energy and other resources, and see their precious stores being depleted are bound to keep raising prices to gain higher levels of income with which to buy other goods they must have. We have to evaluate our production processes, favouring those that require only abundant domestic resources, or those that recycle what we have, to slow the depletion of the increasingly precious stocks of raw materials.

A second question is whether – if world supplies of certain goods are not sufficient to bring all economies up to a minimum standard, perhaps 500 per cent higher than at present in the Third World – certain countries should not be considered to be fully developed, perhaps even overdeveloped, and asked to constrain the consumption of further energy per capita until the poorest meet the minimum standard.

For example, to bring South Asia up to minimum reasonable living standards by the year 2025 will probably require a 500 per cent increase in energy consumption. Asia will need about five times as much oil as Europe now consumes, although it uses little now. The Club of Rome forecasts that such new demand will exhaust world oil resources by early in the next century, forcing the price of oil so high that the developing countries will not be able to afford it for any purpose. Even the substitutes – solar, nuclear, and fusion – will be extremely expensive, particularly for developing countries without indigenous energy supplies or the extensive industrial and technical infrastructures to develop, deploy, and maintain sophisticated new technologies. Substitutes will not usually be as adaptable as oil, or as suitable for fuelling expanding transportation systems. Meanwhile, North America, Europe, and Japan will be using up the world's oil at an increasing rate, absorbing rising costs by raising prices for exportable machinery, equipment, and patents.

Implications for Ontario

It is obvious that Canada, with its supplies of petroleum, including the tar sands and heavy oil deposits, and with large supplies of uranium, is in a fortunate position in a world where energy costs can be expected to rise indefinitely and security of supplies may be in doubt.

The cost of all energy, however, will be forced higher and higher as more distant and more expensive resources are brought into use, and as countries with few resources and expanding demand offer higher prices.

Ontario has supplies of uranium that will meet foreseeable demands until early in the next century. Additional supplies may be found before known economically practical resources are exhausted. With the exception of small amounts of natural gas and a small amount of lignite, however, Ontario has few

other energy resources. Wood supplies are being used more rapidly than regeneration is replacing them. Any new, large hydroelectric projects may be constrained by environmental and social impacts on nearby communities, and such projects would in any case be confined to the extreme northern part of the province.

It is obvious, therefore, that Canada's most advanced industrial province is faced with mounting energy costs and dwindling supplies. The remainder of this report will examine some of the social and land-use constraints that must be kept in mind as Ontario plans its energy future.

Summary

The Global and National Setting

World population will double by early in the next century. More than 800 million were added to it during the 1970s. A world population of over 10 billion may be expected by 2025.

Over 88 per cent of future population growth will be in the Third World. A doubling of the population will require a doubling of investments in social and physical infrastructure simply to maintain present standards of living, and, if progress is to be made, the number of jobs must be trebled.

A stable world will come about only as a result of the development of a more satisfactory life-style for the world's poor. This requires some alleviation of poverty, better housing, adequate food supplies, adequate education and medical care, and the opportunity to work. A new international economic order must be established to permit Third World countries to move from the role of passive aid-recipients to that of active partners with the developed world. The development of a new economic order depends on industrial development in the Third World, in co-operation with the developed world.

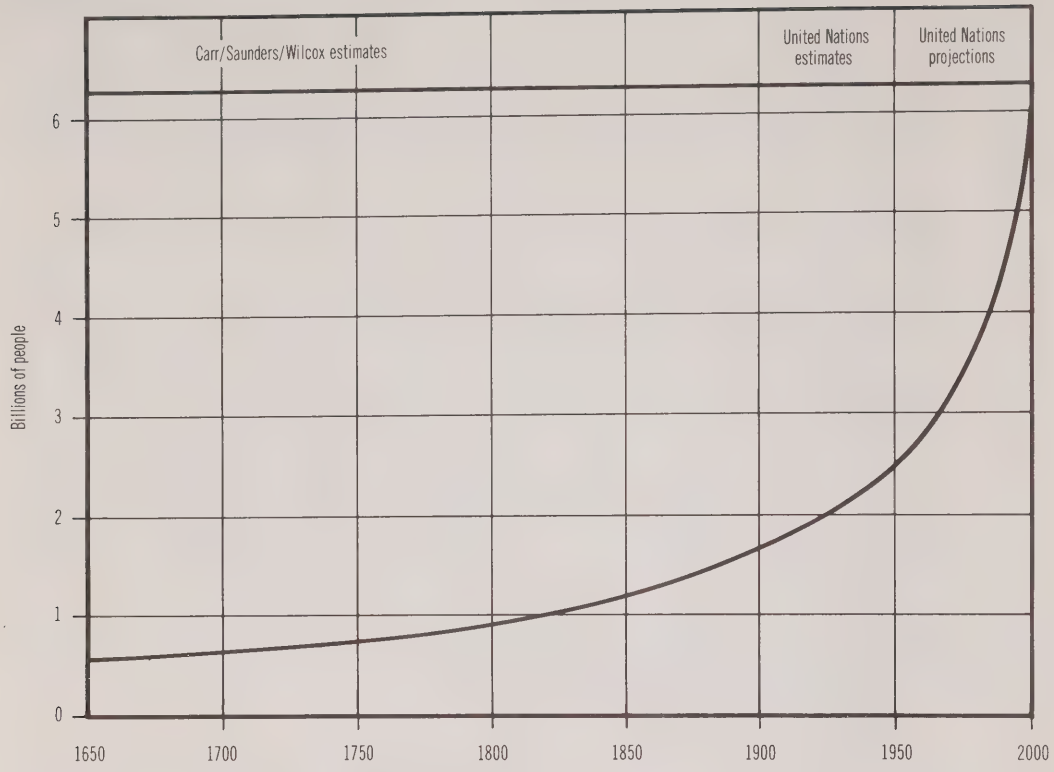
Energy self-reliance for all countries engaging in the partnership must be a primary goal. Each country must upgrade and develop its own natural and human resources to reinforce political and economic goals. This policy should lead to the emancipation of the poorer societies from aid programmes while the richer societies will be strengthened through trade.

The major question is whether the world can find enough resources and energy to fuel a 500 per cent increase in per capita income in the Third World while population trebles. The world therefore faces the necessity for a new evaluation of production processes, favouring those that require only abundant domestic resources and those that can recycle resources now in use.

Certain countries may have to come to accept themselves as "fully developed" or "overdeveloped" from the point of view of energy consumption and must take steps to constrain per capita energy consumption until the poorest countries meet the minimum standard necessary for a satisfactory life-style and political stability.

In the meantime, Canada must develop an energy strategy while maintaining current life-styles; constrain the use of oil and promote the use of more abundant natural gas, wood, and other alternatives; and encourage a more efficient use of electricity. This will permit a transition to new energy forms.

Figure 2.1 World Population



Source: Principles of Demography by Donald J. Bogue. New York: John Wiley and Sons.

CHAPTER THREE

Environmental Management

The following is an abridged version of an unpublished paper by Dr. E.F. Roots, Environment Canada,[1] which sets out the issues of environmental management in a lucid manner.

Environmental problems become issues that need policy, regulatory action, or expenditures of public funds in the following circumstances:

- When there is a conflict between the use of resources for immediate economic or social benefit and the long-term life-support or economic-support functions of the same resources (clear-cutting a forest without reforestation leading to soil erosion, river siltation, wildlife problems).
- When there is concern that currently accepted but widespread actions, harmless in themselves, may have a cumulative effect on the environment (fertilizer and pesticide use in agriculture, leading to water pollution and the destruction of wildlife).
- When there is evidence that human actions are creating stress for non-human parts of the ecosystem (DDT effects on birds).
- When human effects are so directly related to environmental conditions that reliable and accurate information is essential to safety, a functioning economy, or social needs (weather information, sea-ice reports, land-use inventories, counts of schools of fish and herds of caribou).
- When decisions are being made about the allocation of resources for construction projects or industrial developments, whose effectiveness will depend upon the incorporation of environmental knowledge at all stages (design and engineering of pipelines).
- When use is being made of common property resources to the benefit of some and to the cost of others, but the responsibility for ownership and control and the allocation of costs and benefits is not clear or must be decided in advance (protection of migratory birds, prevention of ocean pollution, alignment of transmission lines).

These issues have in common the following attributes:

- They are the result of human desires or activities in conflict with or overridden by natural realities and non-human processes.
- They are rarely self-correcting, but if not deliberately controlled lead to a new environmental and human situation that is less favourable for social well-being.
- They deal with a complex set of causes and effects, of costs and benefits, with which tangible and intangible, present and future factors become interwoven, so that quantitative evaluations are rarely adequate and the issue becomes value-laden, often with ethical overtones.

Dealing with these conditions requires planning, the assembly of information, public discussion, and political action. In almost all cases, decisions must be made that yield benefits to some and generate costs for others. Society must then work out ways of determining whether long-term benefits outweigh costs. If they do, and if the decision is made to proceed with a course of action that is in the long-term interest of the majority, the minorities who bear the costs must be compensated in some way for the burden society wishes to impose upon them.

The processes described above are the elements of sound environmental management.

Principles of Environmental Management

The principles of environmental management that must be kept in mind are:

- Full knowledge of resource assets, of regional and global environmental capacity, and of net demands for resources is essential to intelligent use of finite resources.
- An understanding of environmental processes is essential for responsible management. In a democracy, this knowledge needs to be shared by all citizens, planners, businessmen, and consumers.
- Planning requires attention to health, safety, social services, and economic benefits or costs.
- Planning must be multidisciplinary and comprehensive and must recognize that existing knowledge is incomplete.
- Since everything is connected to everything else in the environment, it must be recognized that environmental problems have local causes, but widespread consequences; the future is just as important as today; long-term consequences must be judged on life-support, not economic grounds; and long-lasting and cumulative problems require long-lasting and cumulative solutions.

The area of application of an environmental policy should be at least as large as the area of influence of the affected ecosystem.

Environmental management will require a change of values:

- Demands must be tailored to the realities of natural resource limits.
- Environmental and social policies must sometimes adapt to changing social values but often should bring about changes in social values.
- Differing and often conflicting expectations of individuals and of various parts of society must be recognized and accounted for.
- "Harmony with nature" does not mean the end of conflict and competition; it means resolving conflicts over certain natural resources in order that others are made more useful.
- Conservation of energy and materials is a question of values rather than merely a problem of economics, institutions, or technology.
- In dealing with the potential impacts on the environment of new processes, new chemical products, and new development schemes, the prudent approach is to assume "guilty until proven innocent" with regard to likely harmful side-effects or long-term disruption.

Responsibility for Environmental Management

Responsibility for environmental management must encompass all citizens, all levels of government, and local, national, and international business:

- Governments must be aware of environmental and resource-related aspects of their policies and decisions, and should provide the public with information about the environmental basis of their policies and their appraisal of environmental consequences.
- The policies and practices of various levels of government must be compatible and consistent.
- Individuals have a right to be informed about and involved in the making of decisions that affect their well-being.
- The total long-term costs of avoiding, correcting, or compensating for environmental damage should be the responsibility of those who cause the damage.
- Public authorities must prevent handicaps from being imposed, through misuse of the environment, on areas beyond national jurisdiction, on ecosystems whose relation to humans is obscure, on individuals whether or not they participate in the economic or political system, and on future generations.
- Policies should foster creativity and individual enterprise aimed at developing improved techniques of environmental management, and should ensure that management techniques are sufficiently flexible to respond to new information and opportunities.
- Individuals and institutions must become conscious of possible long-term and irreversible consequences of decisions and policies, in order to minimize or eliminate their impact.

Areas of Environmental Concern

While it is extremely difficult to describe the most desirable state of the environment or the extent of its acceptable deviation from the desired state, some aspects of the Canadian environment cause concern.

Air Quality

The Canadian population is concentrated in a narrow strip along the United States border and many of the larger cities are downwind from the most serious sources of pollution. The most populous sections (southern Ontario and Quebec and the lower mainland of British Columbia) experience air-pollution problems similar to the most densely populated nations of Europe. Much of this pollution, in Southern Ontario and Quebec, comes from U.S. sources. Acid rain and snow are affecting at least 48,000 Ontario lakes and threaten the future croplands of southern Ontario. Environment Canada has concluded that some parts of Canada are already approaching or exceeding allowable maximum atmospheric loadings, and committed or planned energy and industrial developments will aggravate an already serious problem.

Climate

The Canadian climate is becoming better understood, and it is clear that fluctuations in temperature may change dramatically the northern boundaries of certain valuable crops. Meteorologists now believe that the last 30 years have been unusually favourable. When recent gains in crop yields are

placed in this context, it becomes most important to plan for more "normal" periods of temperature and drought, which could sharply limit Canada's capacity to produce crops and even to expand industrial output. A period of prolonged dryness on the Prairies, for example, may limit industrial growth because essential water supplies will be unavailable. This will also lead to reduced agricultural output and exports.

Demography and Land-Use

If Canada's population continues to have a low (1.8 per cent) fertility rate, and a net immigration rate of 100,000 per year, we can expect to have a population of about 30 million by the year 2000. This could have important land-use and environmental consequences:

- Urbanization will continue, to the point where 94 per cent of Canadians will live in settlements of 1,000 or more, compared with 76 per cent today. One-third of the total population will probably live in Montreal, Toronto, and Vancouver.
- The tendency to smaller families could mean that 90 per cent of the housing necessary up to the year 2000 will have been built by 1986. Most of this housing will be built in urban areas. It will determine for a generation the style and location of housing, and the style of life and community structure, and it will have a direct bearing on transport and utility requirements, adequacy of recreation and open space facilities, energy requirements, and pollution levels.
- The expansion of urban areas will take place largely on foodland. More than half of Canada's foodland lies within 80 km of our 19 largest cities. With present prices for farm products, farmers cannot compete with urban users for the best land.
- Urban growth has meant urban sprawl, with wasteful use of foodland, high energy consumption, high public service costs, and unbalanced communities. Even with higher densities, up to 10 per cent of Ontario's foodland may be converted to urban use by the year 2000, if steps are not taken to prevent it.
- Governments and key sectors have not co-ordinated their use of foodlands. The use of the most valuable land for transportation, power transmission, industrial sites, and recreation remains unco-ordinated.
- There is a Canada Land Inventory for foodlands, but none for forested lands, wetlands, or scrublands to allow for land management on a broad scale. Systematic information is only now being assembled on land capability and renewable resources, together with land use by wildlife and humans. Early evidence suggests that much of Ontario's foodland is threatened, and the forests are not being replaced as rapidly as they are being harvested.

Land-use problems away from urban areas that require attention have to do with radioactive waste disposal in Ontario, large-scale forest harvesting in northern Ontario, the uses of waste heat now being disposed of in the Great Lakes, the use of rural lands for roads, power lines, and pipelines, and the use of northern lands, which are occupied chiefly by native peoples.

Wildlife

"Conditions that support the most vigorous wildlife populations are the same conditions that are most attractive and useful for human purposes." In Ontario, the most valuable timberlands and the best wildlife habitat are in the Great Lakes forest region, which has been largely reduced to farm woodlots. Farther north, wildlife populations are threatened by pipelines, roads, and mechanized hunting.

Forests

Canada is a land of trees. If our country were viewed from outer space, the dominant feature visible from a distance would likely be the boreal forest which stretches from Newfoundland to the Yukon. It is this forest that makes forestry our most important primary industry and wood products our most important cash crop. The forests also provide the habitat for wildlife and rural dwellers; they control stream run-off and erosion; they respond to and in turn influence our climate. They even regulate our oxygen supply.

However, insect problems have become severe in Ontario and British Columbia; the mix of the forests is changing from more valuable to less valuable species, and active reforestation is lagging seriously behind cutting. Replacement is not keeping up with use, and the future of the forest industry is therefore in doubt, pending action at all levels of industry and government.

A particular management opportunity exists in Ontario, where the magnificent mixed-hardwood

stands were cleared for agriculture, leaving only a small woodlot on each farm for fuel. These woodlots have become dormant since the arrival of oil, gas, and electricity for fuel, but with improved management they could become an extremely valuable resource for the manufacture of furniture and wood components.

(The above section was based on a paper by Dr. E.F. Roots.)

Conservation in Environmental Management

One writer has suggested that "the object of conservation is not to deny ourselves conveniences, preferences, necessities or other aspects of life-styles, but instead to make these activities more economically efficient".[2] Other writers focus on the ethical arguments for conservation, saying that conservation means "using our natural, human and capital resources in an ethical manner".[3]

The Science Council of Canada combined the ethical and economic aspects of conservation in listing the principal policy thrusts of a conserver society: concern for the future; economy of design; diversity, flexibility, and responsibility; recognition of total costs; and respect for the regenerative capacity of the biosphere.[4]

For many years, resource costs were stable, and economists focused their studies on labour productivity. Now, energy and non-renewable materials are rising in value faster than labour. If this continues, energy-users must attempt to increase the economic and physical efficiency of energy use, in the same manner as European countries, where for many years energy has been two or three times as expensive as in North America. Energy conservation can lead to a more efficient use not only of energy but of capital and labour as well. An energy-efficient society will, in the long run, be stronger, more competitive, and wealthier than a society that uses its resources wastefully.

For example, a study by Dow Chemical estimated that if both electricity and heat were co-generated on site by large industrial power-users, and power and steam were shared with public utilities, the required investment would be $13 billion instead of an investment in utilities alone of $29 billion and there would be a saving equivalent to 725,000 barrels of oil per day. The Ford Foundation Energy for the Future study showed that a reduction of energy demand by 33 per cent by the year 2000 through the use of more energy-efficient technology and habits would mean a capital saving of 300 billion.[5]

In the Ford Foundation scenario, upgrading the insulation of homes and buildings alone would replace the equivalent energy output of oil refineries producing 2 million barrels of oil per day, or 75 nuclear plants of 1,000 MW capacity, operating at 60 per cent of capacity.

Conservation and Marginal Energy Sources

A study conducted by Dr. Robert Stobaugh of Harvard University suggested: "The real cost of increasing oil imports only becomes apparent when one includes not only the indirect costs associated with the political and strategic dangers posed by dependence on the Middle East but also the implied costs of increasing the demand for oil from OPEC."[6]

The U.S. has increased its imports of OPEC oil by 2 million barrels a day since the major OPEC price increases of 1972-4. This gave OPEC the leverage necessary to raise prices by $10 a barrel, for the 8 million barrels a day which the U.S. imports. The 2 million marginal barrels have therefore cost the U.S. $10 × 8 million barrels per day for a marginal cost for the 2 million barrels of $40 a barrel. The U.S. should be willing to spend a minimum of $40 a barrel to develop alternatives to the further expansion of its oil imports. The alternatives are conservation, domestic production, and new energy forms.

Conservation, by slowing the increase in the costs associated with marginal, less accessible sources of energy, will make it possible to delay the use of very-high-cost sources such as arctic gas and oil, tar sands, and oil shales and the introduction of processes that are available to generate expensive fuels. In turn, this will extend the period in which North American industry will be competitive with that of the rest of the world. The cost of drilling and equipping oil and gas wells is rising rapidly as deeper wells and offshore locations are developed to help satisfy the traditional demand. The development of lignite deposits, tar sands, and other resources, and the production of synthetic fuels from coal, will require vast investments in earth-moving, drilling, and water and waste disposal – all activities that use energy and are extremely capital intensive. The provision of supplies of electric power in the future will require vast amounts of capital, materials, and labour, and will require huge amounts of cooling water and land for power corridors. "Expensive or marginal energy resources, no matter how large they may

be in BTU content, pose tremendous environmental problems if they are to be exploited on a large scale . . ."[7]

Conservation, by allowing society to buy time for the testing and environmental engineering required to ensure clean and safe recovery of energy, makes the total energy requirement more manageable. It also makes it more probable that the social costs that are involved, for example, in settling native land claims, in finding safe and suitable disposal sites for nuclear wastes, and in coping with the social pressures created by large energy projects, can be taken into account.

Ontario Policy

Ontario's present energy conservation policy is intended to reduce energy demand growth to 2 per cent per year. The programmes developed so far are voluntary, avoiding government intervention but offering limited tax rebates and write-offs for conservation-related capital expenses. Information programmes, demonstration projects, and a small amount of research have been undertaken. The Thermographic Information Clinics, which show clearly where the heat is escaping through the walls and roofs of homes and factories, have been most successful.

The Ontario programme has been strongly criticized for its limited nature. Programmes in the U.S., for example, permit much faster write-offs for investment in conservation, require mandatory energy-use reports each year, provide tax credits for non-oil-and-gas energy and recycling equipment, and require energy-efficiency labelling on all appliances.

Other criticisms of the Ontario programme refer to a lack of credible and consistent information on energy supplies and prices and a lack of effective communication from government on the role of conservation in balancing the provincial energy budget. So far, industry in Ontario has generally treated energy conservation as a cost-reduction measure rather than as an essential expenditure such as for the maintenance of safety, health, and environmental standards. Conservation investments are expected to bring a higher return than other investments.

Priority Areas for Conservation Investment in Ontario

Housing

The installation of maximum insulation in new housing could increase the cost of a house in Ontario by from $2,000 to $2,500 (1978 dollars). It is possible that adding this amount to the price of a new home would deter first buyers for one or two years, but this effect would be offset by the 20 to 40 per cent lower costs of heating and cooling over the period of ownership.

Community Structure

Even more significant savings could be made by developing more energy-intensive house designs and community plans. Smaller lots and houses and higher-density group housing can reduce energy and land servicing costs by up to 45 per cent per unit.[8] If such developments can take place on mass-transit routes, transportation savings can be achieved.

Apart from direct energy savings, such development provides lower pollution emissions from houses and cars, reduced storm-water run-off due to reduced areas of roofing and pavement, and other benefits.

At the same time, it must be recognized that Canada has not yet accepted high-density housing as a necessity and that social, psychological, and physical stresses have been identified with higher-density living conditions.

Industrial Conservation

Some industries have made extensive changes in technology and practices, aimed at reducing energy inputs. Such changes were not justified until energy prices rose, making conservation both a necessity and a good business decision. Co-generation of electricity, more efficient use of petroleum products, recycling of used resins, oils, and industrial chemicals, new processes that can yield more output per kilojoule, are being introduced as rapidly as they become economically feasible. Large investments will be needed to upgrade Ontario's pulp and paper and manufacturing industries, in particular.

Agricultural Conservation

> If all the world were to farm, process, and prepare their food as North Americans do, the world food system would require 80 per cent of the world energy budget.[9]

A priority industry for energy conservation is agriculture. Ontario agriculture has increased its consumption of fossil fuels by 500 per cent since the 1940s. Energy inputs into Canadian agriculture by 1975 were $1.1 billion, of which electricity amounted to $58 million, fertilizers $488 million, and petroleum $553 million. While this amounts to just 3 per cent of Canada's national energy budget, the food industry as a whole consumes 15 per cent, since it takes four times as much energy to transport, process, package, and prepare food as it does to produce it on the farm.

On the farm, fuel and lubricants represent two-thirds of total energy use, fertilizer and pesticides about one-sixth, machinery one-twentieth, and other uses one-tenth (see Figure 3.2). Consumption is rising rapidly, both in absolute terms and in litres consumed per hectare cultivated. Fig. 3.2: p. 21

Fertilizer accounts for 17 per cent of total energy consumption in farming, and consumption has tripled since 1965. Pesticide use has risen even faster.

To conserve energy, the best land must be kept in production. Class 1 land produces twice as much food as Class 4 land, with the same inputs of energy. Classes 1, 2, and 3 agricultural land make far more efficient use of energy inputs than do lower classes of land.

The North American diet includes large amounts of meat, which requires far more energy to produce than do vegetables or cereal crops. Scarce fuel inputs could achieve much higher returns in food energy in such crops as soybeans, wheat, corn, and potatoes, rather than beef, pork, and chickens. However, the Canadian diet is not likely to change quickly to a vegetarian base. What is likely to happen is a steady increase in the cost of energy-intensive foods such as beef, pork, and poultry, as the high cost of inputs is reflected in the consumer price.

On the Ontario farm, conservation measures that are required include better use of manure and crop residues, both for fertilizer and methane production; more efficient crop-drying techniques; better insulation of livestock housing; improved forms of fertilizer, including the use of nitrogen-fixing crops in rotation; more efficient use of pesticides; and more efficient operation of farm machinery.

The federal government's national energy strategy (1976) called for the farm input and processing sectors to reduce energy input by 25 per cent in the next 15 years. Farmers were called upon to reduce energy use by 15 per cent.

The Science Council of Canada has estimated that all of Canada's farm tractors, cars, and trucks could be fuelled, and Canada's farmhouses heated and their electricity provided, with methane from one-third of the country's crop residue and one-fifth of the animal wastes. The remaining sludge, after use of the methane, would still be valuable as an odourless, biologically stable fertilizer.

Food Transportation and Processing Conservation

Thirty-two per cent of the total energy consumed by the Canadian food system is used in food processing and packaging. Another 20 per cent is used in transporting and distributing food products. In both industries, there are substantial opportunities for reducing energy inputs.

Even in the households of Ontario, 30 per cent of all food-system energy is used to power refrigeration, cooking, and heating units. Consumer education will be essential to any effort to reduce energy demand in this component of the food system.

Agriculture is one of the largest users of petroleum products in Canada, consuming 7.9 per cent of the gasoline and 12.2 per cent of the diesel fuel. Farm expenditure on petroleum products represents, on the average, more than 10 per cent of the operating costs of Canadian farms. Figure 3.3 shows the trend in consumption of motive fuels by Canadian farmers. Fig. 3.3: p. 21

Fertilizer Use. Overall, fertilizers account for over 15 per cent of the total energy consumption in farming. The trend since 1964-5 in total fertilizer consumption for the three primary nutrients is shown in Figure 3.4. Fig. 3.4: p. 22

Pesticide Use. Pesticide consumption in Canadian farming has been increasing rapidly in recent years, especially since 1972. The trend in sales in current dollars compared with pesticide prices is shown in Figure 3.5. Fig. 3.5: p. 22

Since most pesticides are manufactured from basic chemicals such as ethylene and benzene, which are

derived in intermediate stages from natural gas and crude oil, the growth in production and consumption of pesticides represents an increasing fossil fuel requirement.

Energy Consumption in Food Processing and Packaging

Thirty-two per cent of the total energy consumed by the Canadian food system is used in the food processing and packaging sector (see Figure 3.1). Modern trends in marketing are dictating a shift to smaller containers, individual packaging, and preserved or frozen food dishes as opposed to fresh food products. The energy costs of such habits and the energy demands of various types of packaging are reflected in Tables 3.1 and 3.2.

Fig. 3.1: p. 23

Table 3.1 Energy Used in Food Processing for Various Crops

	Energy in joules per kilogram				
Crop	**Home Grown**	**Fresh**	**Canned**	**Frozen**	**Dehydrated**
Corn	–	12,210,450.0	23,955,740.0	29,653,950.0	86,287,180.0
Carrots	3,023,540.0	11,047,550.0	21,397,360.0	29,653,950.0	86,287,180.0
Apples	2,132,758.6	13,838,510.0	930,320.0	21,397,360.0	53,958,560.0
Potatoes	6,628,530.0	14,536,250.0	20,932,200.0	34,770,710.0	62,098,860.0

Source: Based on data from Agriculture Canada, "Energy and the Food System", December 1977.

Table 3.2 Energy Used in Packaging

Type of package	Energy in joules per kilogram
Glass	17,741,202.4
Steel	34,410,211.0
Plastic	43,129,635.2
Paper	47,446,320.0
Aluminum	229,361,092.8

Source: Based on data from Agriculture Canada, "Energy and the Food System," December 1977.

Energy Consumption in Food Preparation

Food preparation uses about 30 per cent of all food-system energy. Consumer education will be essential to any effort to reduce energy demand in this component of the food system. Most energy-conserving practices centre around the major appliances: refrigeration and cooking and heating units.

Table 3.3 Energy Use by Major Food Appliances

Appliance	Megajoules per year
Blender	175.449
Broiler	684.321
Carving knife	21.902
Coffee maker	2,739.381
Deep fryer	1,131.448
Fry pan	3,518.766
Hot plate	615.819
Mixer	309.424
Range with oven (electric)	17,228.02
Toaster	1,025.899
Waffle iron	150.518
Waste disposer	288.687
Dishwasher	3,394.344
Water heater	7,570.17
Refrigerator	49,810.74
Freezer	15,497.762
Range with oven (gas)	13,238.128

Source: Based on data from Agriculture Canada, "Energy and the Food System," December 1977.

The Agricultural Institute of Canada, in a paper entitled: *An Energy Policy for the Canadian Agriculture and Food System*, summarized specific areas of savings possible in the food industry:

Production Inputs

- increase operational efficiency of machinery and power units
- improve design and management of irrigation and crop-drying systems
- improve designs of farm machinery
- increase insulation of all heated farm buildings
- increase use of agricultural wastes and animal manure to reduce amount of chemical fertilizers needed
- use solar energy to dry crops, heat livestock buildings, heat service buildings, and heat water
- recover heat from air in buildings and use it to preheat incoming air
- use waste heat from generating plants to heat greenhouses, livestock shelters, and aquaculture facilities
- use wind energy if site of farm and other factors are favourable
- design more energy-efficient greenhouse facilities that are adapted to various regions of the country
- implement minimum or zero tillage techniques where these would be energy-efficient
- increase crop rotation with nitrogen-producing legumes to reduce chemical fertilizer requirements

Processing and Packaging

- design new processing machinery and techniques that are more energy-efficient
- encourage the consumer to shift demand to more efficient packaging and away from convenience packaging
- use fuels in abundant supply, such as coal and electricity
- convert wastes from processing facilities into energy sources that can be used to fertilize plants
- use solar energy for processing, as much as possible
- reduce maximum demand load on energy by shifting large processing jobs to off-load hours, where possible
- utilize gravity flow of food being processed wherever possible
- schedule full and continuous processing runs as opposed to partial processing runs
- minimize water use in processing and reuse water by counterflow where possible
- investigate alternative blanching procedures and avoid unnecessary cooling of blanched products
- review product receiving, cold storage, and handling and cleaning methods to determine whether engineering changes are feasible for energy or water conservation

Transportation and Distribution

- provide economic incentives to shift to more energy-efficient means of transportation
- design more efficient scheduling and loading methods
- improve efficiency of trucks, trains, and ships by new designs to reduce drag
- develop innovative modes of transportation of materials that are more energy-efficient, such as pipelines for coal
- maintain engine temperature of transport trucks at a higher level to reduce wear and save fuel use for gasoline-powered engines
- encourage the use of double trailers for transport
- schedule regular maintenance to maintain efficiency of truck engines
- encourage the use of diesel-fuelled trucks
- install air seals around truck loading-dock doors to reduce warehouse heat losses
- install radiator shutter systems on trucks to provide a fuel saving over the thermatic fan system
- shut down truck engines when loading, unloading, or waiting
- eliminate lighting on top of stacked material in warehouses and minimize required heating in warehouses

Preparation of Food

- provide economic incentives to consumers to encourage purchasing of more energy-efficient appliances
- develop federal regulations to encourage more efficient appliance usage with respect to energy consumption
- utilize slow roasting techniques in ovens at lower temperatures to reduce energy used

- eliminate preheating of ovens for food that will be cooking for a long period of time
- use ovens to capacity and avoid oven use for items that could be cooked by other means
- calibrate oven thermostats to ensure correct cooking temperature and maintain maximum efficiency
- allow frozen foods to thaw before preparation
- locate refrigeration and freezer space away from heat-producing equipment
- keep all food-preparation equipment cleaned and maintained to improve its efficiency
- keep water needed for preparation of food at minimum possible temperature to conserve energy
- utilize natural lighting in food preparation areas wherever possible

The Impact of Conservation on Employment

Energy conservation substitutes capital, materials, labour, know-how, and management for energy. Manufacturing is encouraged to be more innovative, and the substitution of more labour (or better design) will usually result in more employment with less energy.

In industries that conserve energy, employment will generally increase, since nearly every energy conservation strategy calls for labour-intensive activity, such as installing insulation and double-glazing windows, and developing thermostatic control devices to monitor and adjust energy use in plants and buildings. Long-range conservation calls for equipment, consultants, architects, and designers. The costs of changing to a more efficient use of energy are, of course, borne out of savings from energy bills, and the net dollar savings are passed on to consumers, reinvested, or taken out in profits. In these and most other conservation applications, energy expenditures are replaced by non-energy expenditures, which generally increase employment.

The employment effects of conservation have led to extensive debate. On the one hand, conservation can lead in the short run to the loss of jobs in an energy-intensive or -associated industry. On the other hand, conservation can lead to a great increase in short-term employment, for retrofitting homes and industrial space with insulation, double-glazing, developing, manufacturing, and selling computers, managing energy use in buildings, designing and building energy-efficient homes and buildings, and developing new forms of energy-efficient transportation and new kinds of communities that conserve energy.

In the long run, the latter path should lead to higher economic and industrial efficiency, lower tax rates, more liveable communities, and expanded exports. Few societies can afford to buy ideas, plans, or products that use energy in a profligate way.

Science Council studies show that Canada would gain employment if conservation measures were undertaken. Imports would be replaced by designs more suited to Canadian conditions. Car repairing, home retrofitting, and widely dispersed investments in energy conservation would create employment for Canadians by reducing imports. There would be growth in the sales of electronic equipment related to maintaining and managing energy use.

However, rapid change in the structure of the economy could create unemployment and social dislocation, if, for example, construction of power plants were suddenly to be sharply reduced. Society must cushion the short-term effects to ensure that the burden of changing energy demands is not inflicted mainly on a small part of the population.

The direct employment and manpower implications of reduced electric power consumption for Ontario Hydro's manpower requirements, for example, must be considered. The difference between a 4.5 per cent and a 3.5 per cent annual growth in demand would amount to some 72,000 man-years over a 20-year period.

While manpower requirements are not directly interchangeable between industries, these labour shifts or job losses are offset by gains in other sectors. In the field of residential insulation alone, it is estimated that at least 1,200 operators employing three or four persons each are currently functioning in Ontario. This compares with about 100 operators five years ago. The added employment from this industry alone, over a 20-year period, could equal over 80 per cent of the 72,000 man-years lost to reduced electric generation plant requirements. Other conservation-related employment results from

the development of new, sophisticated energy-sensing and -metering devices, fuel conservation research and development, and materials recycling. A conservation strategy is at least as labour-intensive as a strategy of ever-increasing energy production.[10] Changes in the kind and regional distribution of employment can be anticipated, however, and should be prepared for by the development of appropriate training programmes.

Higher energy efficiency slows the growth of investment in energy systems to a more manageable rate, easing pressure on interest rates and allowing more personal consumption of other kinds. Proper conservation techniques save more energy than new energy sources can produce, per dollar invested. Some of the money that would have been invested in greater energy production should be invested instead in conservation practices. It has been estimated that "investments in extra efficiency in new and old buildings could economically replace the supply equivalent of 12 million barrels of oil per day in the U.S. by 1990".[11]

Barriers to Efficient Energy Utilization

Since 1972, when world energy prices increased sharply, extensive efforts to conserve energy have been launched around the world. In Ontario, the rate of growth in electric energy demand has been reduced from 7 per cent to 4.5 per cent (early March 1979 forecast) and it is becoming obvious that regulations limiting the size and weight of automobiles are combining with higher prices for all forms of energy to encourage conservation.

There are still significant barriers to the conservation of energy, however. Consumer responses to higher prices have been fairly slow to come about. Obsolete buildings and systems must be retrofitted or replaced. New technologies must be developed and new habits created.

One of the key barriers to conservation is the fact that most power is priced on a block-price basis, with the price declining as consumption increases. This clearly inhibits the installation of more efficient technology or of systems for the co-generation of process steam and electricity. Extra charges are not yet levied on the use of power during peak periods, although peak power is extremely expensive to generate, when the cost of capital is taken into account. As new and more expensive power is brought on line, it should be priced at full cost, to transmit more clearly to power-users the true cost of the resources that are being pre-empted from other uses.

In the production of oil and gas, price controls have kept prices well below world levels. Depletion allowances pass on the cost of exploration to the taxpayer, not the fuel-user, and subsidies to housing, highways, and air travel may distort the real cost of energy and prevent it from being passed through to the consumer. Without accurate price signals, consumers do not make the correct choices of housing, equipment, appliances, transportation modes, or energy sources.

Environmental costs – to cover emissions to air or water, to reclaim mines, to pay for the effects of autombile exhausts, and pay the costs of storing spent nuclear fuel – are not included in the current price of energy but are passed on to the taxpayer, either in the present or the future.

If these costs could be built into the price of energy, each consumer could adjust energy use to the economic optimum, responding to price changes. Energy-users will require complete information about the energy and life-cycle costs of every appliance, automobile, home heating system, and other service, together with the embodied energy contained in them, if choices are to be made. Some of this essential information is becoming available, but regulations are probably needed to speed the process.

As consumers become well enough informed to make such choices, industries will find it necessary to adjust technology in order to remain competitive. The aluminum and plastics industries, for example, have technologies available to them that would reduce their energy requirements by one-third.[12]

There will, however, be a time lag in the introduction of many conservation measures, particularly in the case of existing buildings that may last for decades. Renters will not conserve energy in buildings where heat is included in the rent; families that move often will not find it profitable to improve each home they use; and small businessmen in large structures will be unable to recover investments they make in conservation. Industries in a monopoly or oligopoly position that can pass higher energy prices along to the consumer without becoming uncompetitive (or in industries where no price-competition occurs) will be unaffected. For many products, energy costs are a small part of the total cost and their competitive position in Canada may not be much affected, although their international competitiveness might be.

For equipment that is usually purchased on the basis of the lowest first cost, without much attention to continuing energy costs, there may be little or no incentive to manufacturers to build in conservation measures. Their competitors may be able, with advertising, to outsell them.

On the incentive side, tax benefits can be allowed or subsidies provided to home-owners who undertake conservation, to industries that invest in energy-efficient equipment, and to landlords who improve their buildings. Tax benefits or subsidies should rise with increased efficiency so that action well beyond the minimum required by the standards would be encouraged.

A major problem with conservation is that it requires millions of small investments by individuals rather than a few very large investments by utilities. Since the small home-owner or investor has less ability to assemble and invest capital than the large utility, governments must use low-interest loans or grants to ensure that the necessary capital is available.

A further difficulty is that the ultimate benefits of this investment will accrue to all of society, in a cleaner environment, more efficient industry, and a better life-style from less energy. Since the individual does not experience or even appreciate all of the benefits of his personal decisions, and will not suffer from a failure to undertake changes, there is a "free ride" for those who do nothing.

The final obstacle to conservation programmes is that the energy utilities face slower growth than at any time since the 1930s. The electrical industry continues to favour traditional levels of growth (7 per cent in Ontario) to ensure that energy shortages do not occur and that jobs are provided. Since a single construction or operating job in the nuclear power industry costs upward of $500,000 to create, while jobs in manufacturing and the service industries can be generated for about $10,000, it is obvious that the nuclear industry is an extremely costly source of employment. As Schipper points out: "The degree to which the energy industry participates in energy conservation research, development and implementation will appreciably influence the future demand for energy."[13]

Anti-Conservation – A Growing Debate

> That number (4 per cent growth rate in Ontario electric power needs) flies directly in the face of history (7 per cent for decades), the professionals (Ontario Hydro grudgingly reduced its forecast to 6 per cent only after strong political pressure to become an instrument of economic policy as well as a power supplier), and the facts (Canadian electrical consumption grew at 7.9 per cent during the first half of 1978).[14]

This quotation from the Electrical and Electronic Manufacturers Association of Canada illustrates the diversity of opinion about conservation.

The arguments against reduced demand for energy, and particularly electricity, are well known. The population of Canada can be expected to grow to about 30 million by the year 2000, and much of the additional population will be housed in cities. Air conditioning will become more widely used, electric cars will need to be recharged each night from Ontario Hydro sources, expanding appetites for consumer goods will bring onto the market new and energy-intensive appliances; the growing demand for second homes in the country will expand family consumption of energy; smaller families, coupled with a larger population, mean a growing demand for housing units; the harvesting of more distant and more scattered pools of resources will require more energy input for each unit of output; growing responsibilities for surveillance of offshore and northern resources will add huge energy costs to national management. On the face of it, all of these forecasts call for expanded energy production and marketing facilities, including the expansion of electric power generation and transmission.

At the technical level, the energy industry includes not only Ontario Hydro but major engineering research and development, manufacturing, and assembly facilities scattered widely throughout Ontario. A slow-down in consumption jeopardizes jobs across the province. A slow-down in investment in the face of present conservation and slower growth may lead to higher costs per unit of power in the future, as inflation increases costs. It may also lead to a loss of manufacturing capacity, and to the importing of components if the Canadian manufacturing base is lost.

The danger is that Canada will continue to develop industries and personal consumption habits that are more energy-intensive than necessary, while the rest of the world is developing new techniques and habits that require less energy per unit of output. As all energy costs rise, this would make it extremely difficult to export Canadian goods and services, since they would be relatively more expensive. Unless the residents of Ontario expect to live in an island of expensive technology, enjoying expensive energy

habits, and unless they are prepared to lose export markets, it is clearly imperative that we usher in a new era of energy-efficient technology and sound energy-conservation habits.

Summary

Major Environmental Concerns

> The history of various civilizations has been one of learning to use environmental resources to provide an excess over immediate biological needs and thus to accumulate materials, gain time, or conserve energy, for purposes other than biological survival. Our prosperity, our wealth, our health, and our culture are related to how well we understand and cope with the Canadian and world environment.[15]
>
> Canadians are much affected by the external environment. Nine-tenths of the country is sparsely inhabited and of low biological productivity. The population is highly urbanized, in a few, widely separated cities. The transportation and communication network is essential but expensive. The growing season is short and foodlands make up only 4 per cent of the total land area; humans and wildlife must store food and energy for at least six months of the year or else migrate southward. We attempt to maintain a high level, diversified and egalitarian culture in a highly diversified landscape. Our culture is better suited to the U.S. or Western Europe than to the realities of Canada. We pay for it in heating bills – we have the largest amount of heated indoor space per capita in the world – in salt-corroded cars, in income supplements to fishermen, in fluctuating food costs.[16]

More energy, more specialized technology, and the identification of low-cost products for export have permitted the European culture to exist in the harsh Canadian environment. Much of the environment-centred knowledge of the native peoples has been lost and replaced by the artificial culture of Europe.

The more our activities differ from the processes of nature, the more energy and technology are required to sustain them, and the more the by-products of our activities are likely to interfere with the normal working of the environment.

The Canadian population is concentrated along the U.S. border, and many of Canada's largest cities are downwind of the most important U.S. sources of air pollution. Acid rains are affecting the most valuable farmlands of southern Ontario and Quebec, and have affected fish populations in at least 48,000 lakes in Ontario alone.

Random fluctuations in the Canadian climate can affect the northern boundaries of many crops and the overall area of usable Canadian foodland. The last 30 years are believed to have been an unusually favourable climatic period. Planning should take into account more "normal" periods of low temperature and drought.

Canada's present low fertility rate, coupled with annual net immigration of about 100,000 per year, will lead to a population of 30,000,000 by the year 2000. If present trends to urbanization continue, one-third of these people will live in Montreal, Toronto, and Vancouver.

Most of the new housing projected to be constructed between 1980 and 2000 will be built before 1990, if Canadians continue to have smaller families. The type, location, and design of this housing will determine for a generation the style of life and the community structure and will "lock in" transport, utility, recreation, open space and energy requirements, and pollution effects.

More than half of Canada's foodland lies within 80 km of the country's 19 largest cities. Even with present high food prices, farmers cannot compete with urban buyers for the best land. More of Ontario's most valuable foodland will be converted to urban uses by the year 2000, if steps are not taken to prevent it.

Governments and utilities have not co-ordinated their use of foodlands. The most valuable land is used, independently, for transportation, power transmission, industrial sites, and public recreation.

The most valuable timberlands and the most valuable wildlife habitat are in the Great Lakes forest region, which has been reduced to farm woodlots and is now being converted to foodland.

The future of the Ontario forest industry is in doubt, as active reforestation lags behind cutting.

A large volume of industrial wastes must be disposed of in Ontario and sites must be found that are not only environmentally safe, but that do not transfer the costs of one group in society to another (urban Canadians to farmers) or from one generation to another (long-term effects of nuclear wastes).

Environmental Processes and the Laws of Economics

Economics traditionally assumes a willing buyer and a willing seller, who trade in goods that are both independent of other goods and will be continuously available while embodying all costs, both present and future. The seller is assumed to be the rightful owner and it is assumed that increased demand will bring forth unlimited additional supplies. Economics cannot easily reflect in the present market the future extinction of supplies, costs external to the production process, the needs of those without buying power, or the needs of the future.

Environmental studies centre on the physical, chemical, and biological limits of the supply of materials and energy, to the extent that they can be measured. Such studies began only in the 1960s, when it became clear that economic activities did not ensure unlimited supplies of goods, sufficient to meet all foreseeable human needs and wants. Past rates of economic growth have been achieved, in many cases, through once-for-all exhaustion of non-renewable resources or the use of renewable resources at unsustainable rates.

They attempt to deal with the response of the ecosystem to increasing volumes of wastes, including carbon dioxide, sulphur dioxide, heavy metals, sulphates, and nuclides. Measurement of present effects is in its infancy and anticipation of future effects is still largely a matter of speculation and guesswork.

"Rights and responsibilities" with respect to environmental effects are only now being defined. Downwind and downstream effects of air and water pollution, long-term effects of nuclear waste disposal, the rights of farmers and urban recreationists to rural land, the rights of certain countries to the resources of others – these are all under study, discussion, and negotiation.

Principles of environmental management should include the following parameters:

- Knowledge of resource assets, regional and global environmental capacity, and net demand for resources is essential to decision-making about resource use.
- Environmental processes must be better understood.
- Attention must be given to health, safety, social services, and environmental benefits or costs.
- Planning must be multidisciplinary and comprehensive and must recognize that existing knowledge is incomplete.
- Citizens, planners, managers, processors, and consumers must share environmental knowledge if the optimum benefit from resource use is to be realized.

It must be recognized that:

- Environmental problems have local causes and widespread consequences.
- The future must be taken into account.
- Long-term consequences must be judged on their ultimate impact on global life-support systems, not merely on economic grounds.
- Long-lasting and cumulative problems require long-lasting and cumulative solutions.
- An environmental policy must encompass the area of influence of the affected ecosystem.

Energy Conservation in Environmental Management

Energy conservation measures could reduce energy demand in the 1990s to levels as much as 40 per cent below levels predicted in the mid 1970s.

New technologies will be required, as will higher prices for energy, to make conservation more attractive to consumers.

Conservation measures will be adopted only when consumers are rewarded directly for their implementation and can obtain a higher return from a personal investment in conservation than from other investments.

Changes from socio-economic patterns and value systems will be required as conservation measures are introduced. An intensive dialogue between citizens and government is required to redefine social goals.

The invisibility of energy flows is a major constraint to the development of citizen awareness of conservation issues. Every energy-using instrument should be labelled with its energy-efficiency, and efforts should be made to provide citizens with low-energy options in transportation, home heating, appliance selection, etc.

There are opportunities to reduce the use of energy in the food system, including agriculture, by up to 30 per cent. The Agricultural Institute of Canada has developed a list of steps to be taken.

Energy conservation substitutes capital, materials, labour, research, and management for energy. The substitution of more labour (for research) for energy should result in more employment.

Short-term dislocations resulting from energy conservation must be cushioned to ensure that the burden of changing energy demands is not focused on a small part of the population.

Pollution abatement now requires up to 4 per cent of total energy. Conservation measures, by reducing this use of energy, will directly affect energy use.

The energy industry's share of total GDP, in the absence of conservation, will grow rapidly in the next 25 years. Capital used in this way will reduce the ability of consumers, industry, and government to undertake other activities and will pre-empt capital needed to achieve other societal goals.

Conservation will slow the development of much higher-cost, less accessible, and more energy-costly sources of energy. This will extend the period of North American industrial competitiveness and buy time for the further research and development required to make the future energy needs more manageable.

By reducing North America's growing dependence on OPEC sources of oil, OPEC's bargaining power will be reduced. A recent study has shown that if the U.S. could curb its growing demand for imported energy, world oil prices would rise much less quickly. Otherwise the marginal cost of a barrel of oil could rise to $30-40 (1978 dollars) because of the added pressure on the world supply-demand balance.

Conservation, by buying time, allows society to take into account the socio-economic costs of energy, including the settlement of native land claims, the reordering of social and economic priorities, and the social impacts of plant construction. It also provides an opportunity for society to consider a change to the "caring society", or the "conserver society", as an alternative to further growth.

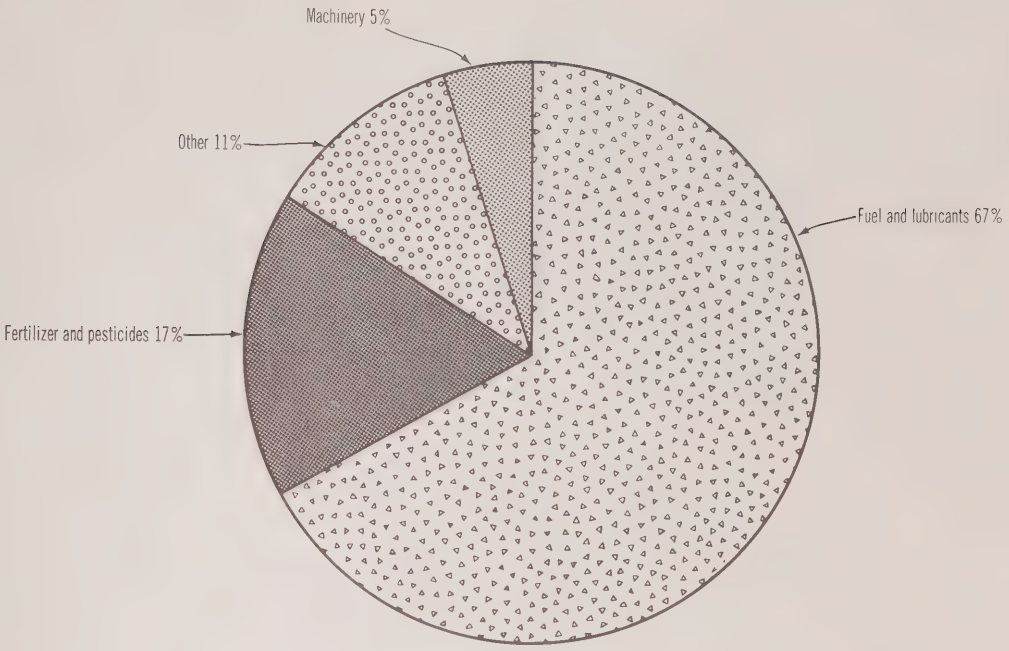
The market system should be used to encourage conservation by passing on the full costs of energy to the consumer. At the same time, consumers must be given full life-cycle costs of every energy-using appliance or piece of equipment so an optimal choice can be made.

For long-life energy users, or consumption items in which there is little immediate market-responsiveness (apartment blocks, public and private buildings) there must be both government regulation and tax incentives to promote retrofitting and conservation investments. Low-interest loans or grants may be needed to help the investor/consumer/home-owner to assemble the necessary capital. Society will recover the benefits of such investment, and should contribute part of the costs.

There is enormous scope for energy conservation in the food industry, on the farm, in processing and transportation, and at the retail level. To accomplish the necessary transformation in attitudes towards and knowledge of conservation, an energy conservation extension programme should be established. It would provide to industry, commerce, and consumers the kind of detailed do-it-yourself information that proved to be a successful basis for the agricultural extension service. The U.S. is on the verge of creating a national energy conservation extension service – Ontario should create the first provincial service in Canada.

The energy industry itself, despite the prospect of slower growth in energy use, must participate in energy conservation, research, development, and implementation. Not only are existing energy generation systems inefficient in terms of net energy delivered, but most traditional energy systems are moving into a phase where more energy will be needed to produce a unit of net energy for the consumer. In the absence of conservation-related research and development, the result will be more costly energy, leading to a weakening of employment generation and industrial competitiveness.

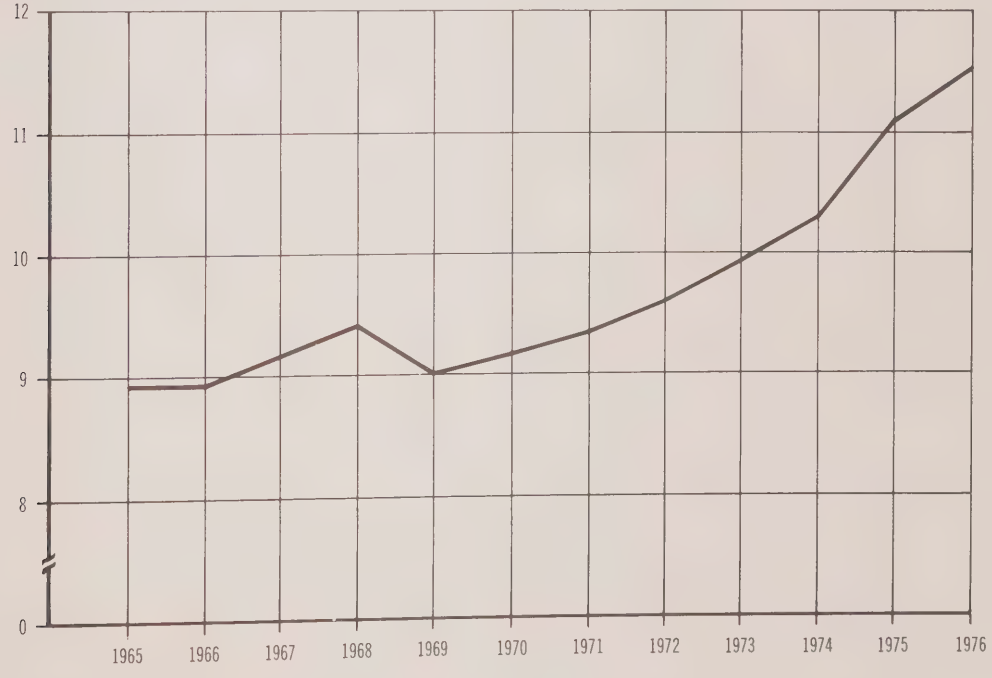
Figure 3.2 Total Energy Use in Canadian Farming



Source: Agriculture Canada.

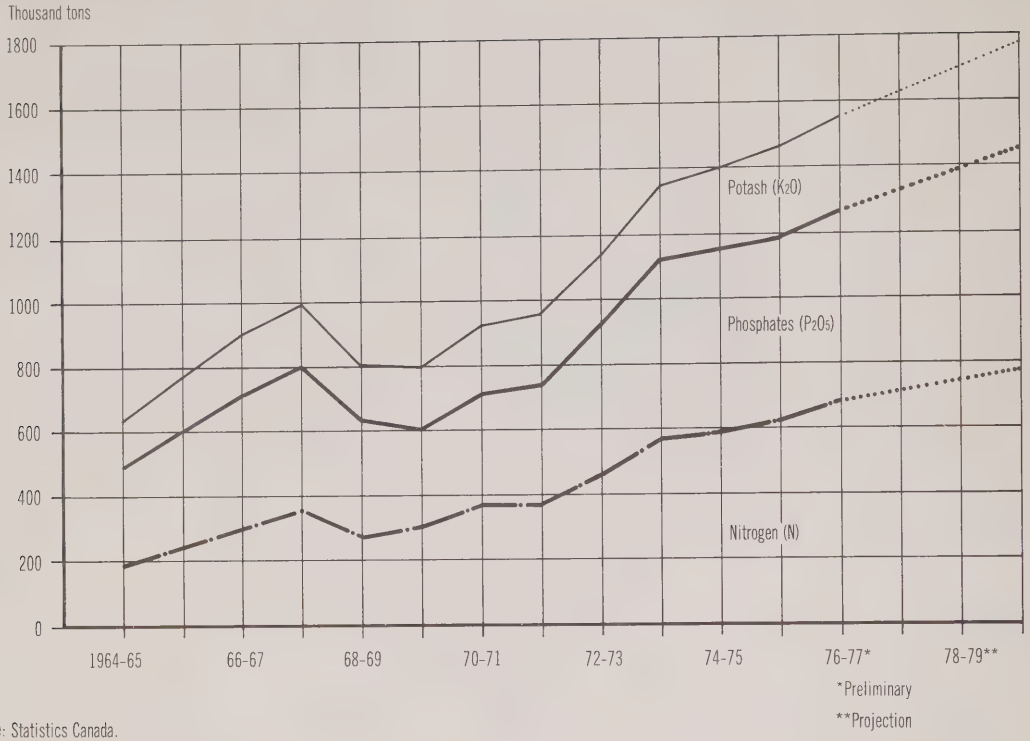
Figure 3.3 Average Consumption Rates of Gasoline and Diesel Fuel by Canadian Farmers

Gallons per acre of principal field crops and summer fallow



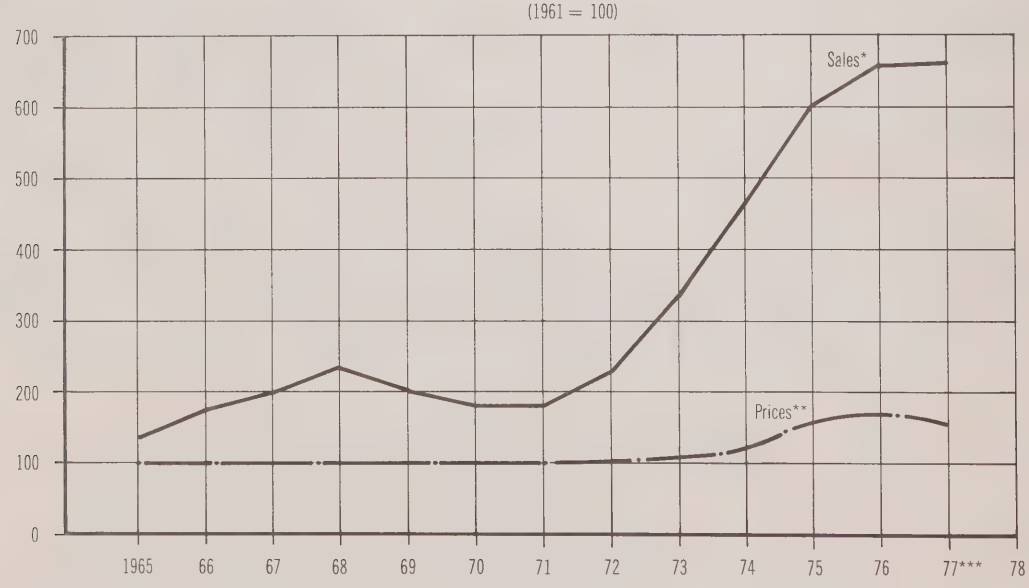
Source: Statistics Canada.

Figure 3.4 Fertilizer Use in Canadian Farming



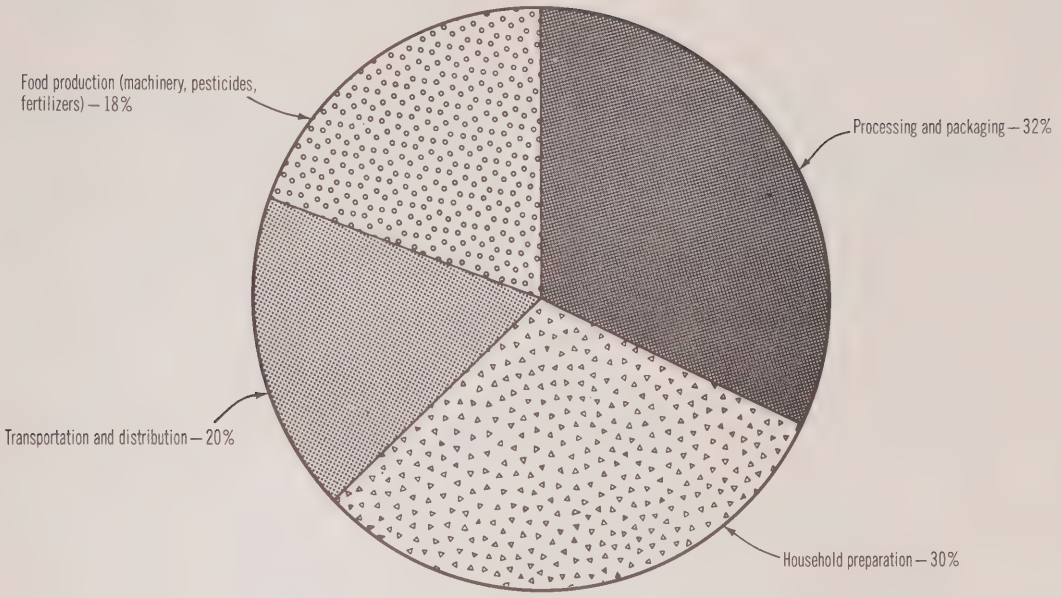
Source: Statistics Canada.

Figure 3.5 Sales of Pesticides to Canadian Farmers and Pesticide Prices



Source: Statistics Canada and USDA.

Figure 3.1 Energy Consumption by the Four Components of the Canadian Food System



Source: RCEPP.

CHAPTER FOUR

Planning in Ontario

The Evolution of Ontario Planning Policy

In 1946 the Planning Act was passed, providing the basis for intervention by the province in land-use planning. In the years since, the province has grown dramatically, especially in the Golden Horseshoe around the western end of Lake Ontario and in the Metropolitan Toronto region. At the same time, rural and small-town Ontario has continued to lose population and political power, despite all efforts to decentralize the industrial and service base, out of the Toronto region.

Both the rapid growth in the Golden Horseshoe, which brought the conflicts between growth and the environment into the open, and the lack of growth in the rest of Ontario placed stresses on the planning system. These stresses led to a series of province-wide reviews of the planning system, including studies by the Ontario Law Reform Commission from 1967 to 1971 (the Milner Reports); the Select Committee on the Ontario Municipal Board (1972); the Ontario Economic Council (1973); the Ontario Task Force on Housing Policy (1973); the Planning Act Review Committee (1977); and the Royal Commission on Metropolitan Toronto (the Robarts Commission) in 1977.

These studies confirmed that Ontario has been going through what planner Eli Comay called "profound social, economic, and cultural changes". One of the changes has been the shift in social and community values that has taken place throughout North America in the 1960s and 1970s;

> ... a growing consciousness of the natural environment and a growing concern with the natural environmental consequences of urban development; concern that agricultural land be preserved and that rural land be treated as a natural resource, rather than as a resource for urban use; concern for public access and involvement in the making of planning decisions; and ... an emerging concern for the energy consumption implications of urban development decisions.

These concerns have led to a still unresolved controversy between growth and anti-growth philosophies. There has also been an increasing public conviction that municipal planning should be more value-oriented and that the process should be made more accountable.[1]

As Comay goes on to say, these trends in community and social values have taken place at a time when the physical and social character of the province is also changing.

> Among these changes are the intensification of urban development densities; major changes in urban social structure; decentralization and other shifts in the location of urban economic activities; increased urban exploitation of rural recreational and residential opportunities and significant depopulation of many rural communities.[2]

There have also been profound changes in the structure, organization, and financing of municipal government and in the provincial role in local government affairs. The structural changes that began with the creation of Metropolitan Toronto some 25 years ago have included the restructuring of a dozen more regional areas into two-tier governments, and some major transformations in the scale of local government through large-scale annexations and consolidations, such as those that took place in the Timmins and Lakehead areas.

Among the organizational changes have been a consolidation of various local boards and a reallocation of many local board responsibilities directly to local councils. There has also been a sharp increase in the share of municipal costs financed through provincial transfer payments. "These changes have reflected ... the provincial government's growing assertiveness and intervention in local government affairs, which has included ... the intermittent imposition of provincial planning policies of one kind or another."[3]

The role of Ontario Hydro as either a cause of stress or an instrument of planned economic development has not been given much attention by any of the reports cited, despite the fact that the very large investments of Ontario Hydro at Nanticoke, Bruce, Pickering, and Atikokan must have had a significant economic and social impact.

Nor is much attention given to forecasting future trends and recommending programmes designed to deal with them. It is obvious from discussions with planners in various ministries within the Government of Ontario, however, that much thought is being given to the challenges of provincial planning in the 1980s and 1990s.

Conditions of very rapid population growth that prevailed in the 1950s, 1960s, and 1970s will probably give way to much slower growth, reflecting the maturing of the post-war baby boom and the desire for smaller families, coupled with lower rates of immigration. For the next five to 10 years, however, more rapid economic growth will still be required to provide jobs for young people and women entering the labour force.

Lower rates of population growth and higher energy costs will cause new stresses on the system. Expectations of steeply rising personal incomes may be difficult to meet as resources become more costly; demand for affordable recreation space nearer the cities may be much increased; business may not be encouraged, in view of slack demand or inadequate depreciation allowances to cover inflation, to increase investments in plant capacity needed to create job opportunities. The traditional incentives of rapid population and market growth may be sufficiently weakened that demand will increase for government intervention in economic growth, particularly in parts of the province where growth expectations have been high, and in northern Ontario.

Ontario's role as the industrial centre of Canada may change, as energy costs continue to rise, and as western Canada expands its industrial base. A major industrial overhaul is required for such industries as meat-packing, mining, pulp and paper – in which existing plant and equipment are now outmoded and less competitive internationally. Not only must earlier technology be replaced, but heavy investments are needed to augment the stock of natural resources – forests, mines, and agricultural land – through reforestation programmes, expanded mineral exploration, and land drainage.

There is concern throughout Ontario industry – not just among large companies, but among small businessmen, farmers, and others – that existing and planned regulation has centralized too much power and has created a situation in which municipalities and small businessmen find new investment both difficult and unprofitable. The Planning Act, the Environmental Assessment Act, and a variety of municipal and federal regulations have created a maze that has reduced the incentive to invest. Both politicians and planners have begun to consider whether a period of deregulation and decentralization of power might not permit municipalities to begin to tailor development to local needs and allow more latitude to business investment.

A further concern is that Ontario Hydro has pre-empted too much capital, thus reducing the province's ability to undertake other investments. The province has come through a period when Ontario Hydro and the provincial government, combined, pressed against the borrowing limits of the province, which were set at about $2.4 billion per annum. With growth rates lowered from 7 per cent to 4.5 per cent, Ontario Hydro now faces a much reduced rate of expansion. At the same time, the province, in an effort to reduce inflation, has cut back on expenditures and, hence, on borrowing.

In addition, a more open style of planning has come into effect. The Royal Commission on Electric Power Planning, the Select Committee on Hydro Affairs, the Eldorado refinery hearings, the environmental assessment hearings on the expansion of uranium-mining facilities at Elliot Lake, the Solandt Commission and other efforts to encourage public participation have raised the expectation that major projects and shifts in policy direction will be accompanied by extensive public dialogue.

In general, then, the province must attempt, in Boulding's words, to be "growing, stable, just and free", keeping the broad public issues in mind, without interfering unduly with Crown corporations, individuals, municipalities, businessmen, or the market system. It must, however, ensure that sufficient investment takes place to create enough jobs; that sufficient oil, gas, and electricity are available to sustain those jobs; that sufficient profits are made to justify the investment of essential capital; that sufficient interest is paid to bond-holders to justify investment in public utilities and government; that rights to develop are delegated to the lowest level of government capable of administering those rights; that farmland is protected, but that profits in land are not reduced; and that the enterprising individual is able to enjoy the fruits of the capitalist society, while everyone is assured at least the basic services essential for a satisfactory style of life.

The task of the planner is therefore both complex and difficult.

Reforming Planning in Ontario.

There are a number of historical reasons for the trend to increased provincial intervention in municipal affairs in recent decades. In view of accelerating urbanization and a fragmented municipal government structure, ill-equipped to deal with the regional effects, increased provincial intervention has been an efficient means of responding to planning problems. Nevertheless, the long-run

effects of such intervention have been to reduce the ability of the planning system to deal with planning issues.[4]

Three major reviews of the planning process – by E. Comay (Planning Act Review Committee, 1977), J. Robarts (Royal Commission on Metropolitan Toronto, 1977), and J. Bossons (Ontario Economic Council, 1978) – agreed that "good planning" was essential for the achievement of broader social, economic, and environmental goals, but that no one is entirely sure what "good planning" is or ought to be. It was recognized that "political realities which take into account subjective values in the society must continue, in a democracy, to take precedence over the views of planners". The three commissions therefore concentrated on the process by which planning decisions are made or delegated. All three recommended these reforms:

- increased political accountability for regulatory decisions
- protection of individual rights affected by regulation
- recognition of the need for predictable regulatory process
- increased efficiency of regulation
- restriction of conflicts among the above objectives

Bossons was particularly critical. He said:

> The rights of individuals and minority groups remain insufficiently protected under the present structure of the municipal planning process. After a decade of completed studies intended to revamp the system, government action is needed now to end the confusion, lack of clarity, inconsistent procedures, and unnecessary delays and costs. The present planning system is ineffective and impenetrable for many citizens. The institutional structure of the planning process is of primary benefit chiefly to those practitioners . . . municipal lawyers and professional planners . . . whose importance is enhanced by its complexity.[5]

> Responsible decision-making has been discouraged by the allocation of final responsibility for most planning and regulatory decisions to an appointed provincial body, the Ontario Municipal Board, subject only to appeals to the provincial Cabinet. Accountability is thus removed from the local level and diffused.[6]

Both Comay and Robarts recommended that the complexity of the present planning system be reduced and that municipal authority over planning be increased. To achieve this broad objective, the following recommendations were made:

1. Reduce the role of the province to the minimum required to achieve provincial goals and to protect individual rights.
2. Eliminate the current requirement for provincial approval of all local planning actions while retaining a provincial power of veto over actions which conflict with specific provincial interests.
3. Reduce the role of the Ontario Municipal Board to the status of an appeal agency for cases where individual rights have been violated by the municipality.
4. Provide for provincial resolution of intermunicipal disputes, including disputes between upper-tier and lower-tier municipalities within a two-tier regional government structure.
5. Clarify the role of upper-tier municipalities. All regulatory powers should be assigned to local municipalities with upper-tier municipalities having the right to appeal against lower-tier decisions.
6. Ensure the right of the citizen to participate in decision-making at the local level and even with respect to large projects favoured by higher levels of government or large public agencies.
7. Encourage more effective regional planning.

In addition, Comay proposed that: "Subdivision approval authority should be assigned to municipalities. Approval authority should be decentralized and the 'rights' of other agencies now involved in subdivision approval should be formalized."

Both reports concluded that the province obscures the accountability of municipal politicians to local citizens; local voters cannot tell who is responsible. Municipal politicians can duck responsibility for their mistakes, blaming the Ontario Municipal Board and the provincial government. Therefore, planning decisions should be political decisions made by majority vote in elected local councils. Robarts quotes Alexis de Toqueville: "Without power and independence, a town may contain good subjects, but it can have no active citizens."[7]

The Role of the Province

Land-use controls are necessary, however, under certain conditions. Four kinds of problems require government intervention in the land market, since the uses of land may not be socially optimal in the absence of intervention. The four cases are local externalities (effects on neighbours of decisions made by owners of land); global externalities (effects of collective actions of all decision-makers); "second-best problems" (caused when a policy does not quite cover all costs); and market myopia (the time horizon of private developers is shorter than that of society).

Examples relevant to electric power planning are: the effect on neighbours of a generation site; the effect on farmers of a power line; the effect on foodland of a decision to shift power lines away from wildland habitat to open fields; and the preservation of foodlands for the future, during periods when market prices are not high enough to keep them in production.

The province must also adjudicate intermunicipal disputes within regions, and ensure that local planning decisions are consistent with the goals of provincial policy. It must ensure that "spill-over effects" of municipal decisions do not have province-wide effects, by providing municipalities with firm policy guidelines on preservation of foodland, control of regional sprawl, the overall distribution of economic growth in the province, and the interaction of local and regional plans with provincial facilities and services (electricity, transportation).

The province must also develop an institutional framework for the resolution of intermunicipal conflicts, for the protection of minority rights, for hearing unrepresented interests, and for assuring consistency of decisions over a period of time. Individual rights that must be honoured include rights of notice, rights to information, the right to be heard, the right to a response from officials, the right to public debate, the right to a record of proceedings, the right to notice of decisions, and the right to object to decisions.

Concerns about Ontario Hydro's Role in the Planning Process

Throughout the hearings of the Royal Commission on Electric Power Planning, individuals and groups expressed a wide range of concerns about the role of Ontario Hydro in planning.

The central concern seemed to be that Ontario Hydro, because of its large size in relation to other institutions and even to the Government of Ontario, is capable of exerting enormous influence on the Ontario economy, on the distribution of business and jobs across the province, and even on the selection of energy technologies that will power the province's industries and homes.

There was great concern that Ontario Hydro does not seem to recognize its broader mandate, but sees itself merely as an electrical utility, committed to producing electric power at least cost and to paying off its bonds.

The following questions and statements have been selected from the proceedings at the hearings:

> Since oil and gas are forecast to be in short supply, how will the provincial economy be protected against inadequate supplies of energy?
>
> There seems to be a missing link in the provincial planning process: how do you connect Ontario Hydro's demands on local municipalities (e.g., its input to municipal plans at Bruce, Nanticoke, or Darlington) with the provincial planning system?
>
> Ontario Hydro projects have the potential for integration with other large industrial developments if adequate long-term planning is undertaken.
>
> Ontario Hydro's role as an economic development tool of the province has been a passive one arising out of its mandate to supply electricity at cost. Unless there is an assurance of alternative supplies of energy at reasonable cost, the electricity supply industry must be the base of Ontario's energy strategy. Ontario Hydro . . . will be the province's insurance against any disruption of supply and escalation of world energy prices. Ontario Hydro therefore appears to be an integral part of the province's economic development and energy policies. For this reason it is particularly important that its pricing policies and provincial objectives are appropriate to the circumstances.

Ontario Hydro's Role

The traditional role of Ontario Hydro in almost all areas of its operations has been one of independence – arm's length – from government. Task Force Hydro, when it examined the role and place of Ontario Hydro in 1972, found that Hydro was "autonomous to a degree which made it unresponsive to broader

social demands and expectations", an attitude that may have been appropriate in the past, but was probably inappropriate in an environment of rising costs, shortages of capital and energy supply, and extensive environmental pollution.[8]

Originally, development of electric power facilities in Ontario was seen, in part, as a means of attracting industry to Ontario and freeing it from dependence on U.S. coal. Thus, the goal was power at cost with which to develop the province's resources and to form a manufacturing base that would be competitive with the U.S. Because much of Ontario's power was hydroelectric, and well below the cost of fossil-fuelled U.S. plants, it provided Ontario with a significant stimulus to industrial growth. This advantage lasted until most hydro sites free of environmental constraints had been developed and Ontario Hydro was forced to move to more expensive thermal sources, fossil and nuclear.

Some of the important features of policies affecting Ontario Hydro were:

1. Financing Ontario Hydro's capital programme has always had provincial support.
2. Revenues were always set above costs to alleviate any burden on provincial revenues.
3. Since 1952, areas remote from generation have been charged the same bulk power rates as those in close proximity.
4. The principle of least-cost procurement has been followed, but the need to develop secondary manufacturing was recognized, provided that such industry was fully cost-competitive.
5. Rural electrification was subsidized by direct government subsidy until the late 1960s.
6. Special rates to attract industry were avoided.
7. Ontario Hydro has expanded rapidly enough to be able to plan, construct, and maintain its plant with its own staff. While this ensured the development of a very large and comprehensive technical staff, the failure to "contract out" technical work and the development of employee tenure agreements have meant that Ontario Hydro is committed to inexorable growth and is virtually unable to reduce its rate of growth in staff and facilities.
8. Until the late 1960s, staff salaries were related to wage levels in local areas. Since then, salaries have been equalized across the province.
9. Cross-subsidization of customers was minimized.
10. Burdens placed on the economy by Ontario Hydro developments have generally been relieved by actions that have minimized the economic impact.[9]

The Ontario Hydro capital and operating budgets are currently about 25 per cent of the combined disbursements of the provincial government. A shift in Hydro's revenues or expenditures can therefore have a powerful effect on economic development in Ontario.

Traditionally, the Ontario government has not attempted to influence Ontario Hydro, apart from the usual informal contacts between political leaders and the leaders of Ontario Hydro. In 1973, however, Task Force Hydro recommended that: "Hydro should be a delivery agency of the Provincial Government receiving broad policy direction from the Government through the Provincial Secretary for Resources Development."[10]

To make the point explicit, Task Force Hydro further recommended that:

> Hydro actively participate in the development and support of government policies with respect to energy and the environment;
>
> Hydro's marketing policy be designed specifically to support provincial energy and environmental policy and, within the limits hereby imposed, to ensure the most efficient use of the system's capital facilities;
>
> There ... be close coordination between Hydro and the Ministry of Treasury, Economics and Intergovernmental Affairs in financial matters, and
>
> In the event that Hydro should be required to support regional development or contra-cyclical construction policies, the additional costs of so doing should not be built into power prices but should be borne by subsidy from the Provincial Treasurer.[11]

In a review of the evidence presented at the various hearings of the RCEPP it is hard to detect any change in Ontario Hydro's policies as a result of this series of recommendations. Hydro staff indicate that they must work within the policies and guidelines of government, as residents of the province, but there is little evidence of "active participation" or "close co-ordination" of Hydro policies with those of the Government of Ontario.

At the same time, Ontario Hydro's budget has been climbing at the rate of about 30 per cent each year,

while the Ontario budget has been increasing at a rate of less than 15 per cent per year, over the last five years.[12]

With a rate of growth roughly double that of the government, particularly in a slow-growth economy of the kind which has characterized the 1970s, Ontario Hydro and its decisions will obviously have a magnified impact, particularly in outlying regions such as Nanticoke and Bruce. Because Hydro's projects are so large and capital-intensive, with very limited job-creation potential except during the construction stage, they may siphon investment capital away from areas considered important by the government. Alternatively, unless sites are carefully chosen, vast amounts of capital may be focused on specific sites for a few years, causing dramatic social and economic changes, until the projects are completed and it is left to others to cover the socio-economic costs. While the Government of Ontario did not move directly to implement the Task Force Hydro recommendations, it did move to make the Ontario Energy Board responsible for reviewing some aspects of Hydro operations, including rate changes (recommended by the Minister of Energy). The siting of generation centres and transmission lines was also opened up for scrutiny.

In mid 1975, however, when Ontario Hydro asked for a 30 per cent rate increase and it became clear that the combined capital requirements of the Government of Ontario and Ontario Hydro were likely to exceed prudent borrowing limits, the province moved to limit Ontario Hydro borrowing to $1.5 billion per year and to review Hydro's plans and the long-term need for power in the province in a more public way, through the formation of the Royal Commission on Electric Power Planning.

The Role of Power and Power Costs in Plant Location Decisions

One of the reasons for the passive role of Ontario Hydro in economic development has been its pursuit of the principle of power at lowest cost. Ontario had abundant hydroelectric power until recently, and this provided cheap power for industries locating in Ontario. With the adoption of province-wide power pricing, electricity could be left out of location decisions entirely, provided that adequate supplies of it could be guaranteed over the long run. Ontario Hydro therefore began to focus on continuity of supply rather than on price.

In the last three years, Ontario Hydro has developed the last of the hydroelectric sites that will offer cheap power. Costly capital is needed for nuclear plants, pushing the cost of nuclear electricity much higher than was anticipated even five years ago. Energy from other sources has quadrupled in price and its supply and price are unpredictable. Environmental impacts of coal-fired plants are of concern, and the impacts of nuclear plants are still unclear. The lead time for new generation capacity has increased from six to 12 or 13 years.

During the same period, most of the world's advanced economies have experienced inflation in prices and a slow-down in economic growth, arising from energy uncertainty and higher energy prices. Conservation programmes have been launched. Automobiles are being redesigned, homes retrofitted, urban systems streamlined, alternative technologies developed. With existing plants operating below capacity, reflecting weak consumer demand, and with interest rates at the highest levels in memory, businessmen have been slow to invest in new plant capacity. Growth in energy demand has fallen from 7 per cent per year in Ontario to about 4 per cent. But the cost of energy continues to rise, reflecting not only high capital costs, but now also the cost of maintaining excess power capacity.

Ontario's businessmen therefore see Ontario's power costs rising across the province, whether demand increases or not. Rather than locate near expensive energy in Ontario, they can locate in provinces where hydroelectric power, gas, coal-fired electricity, and abundant oil create a more competitive energy market. The key location decisions facing Ontario industry may have less to do with site alternatives in Ontario, therefore, than proximity to sources of sustainable, long-term, cheap energy of all types. In a paper prepared for the RCEPP in 1976, John Dean pointed out: "Present costs are less competitive than historically and, currently, they are not competitive with those of Manitoba and Quebec. Within five years it is possible they may no longer be competitive with U.S. suppliers."[13]

The Selection of Generating Sites and Line Locations as an Instrument of Regional Economic Development

In the days of hydraulic power, sites depended entirely upon the availability of abundant falling water. Lines were then constructed to the demand centres. With the development of thermal plants, greater flexibility was possible. However, the use of power plants as an incentive to locate industry in specified

locations was abandoned in 1951 with the adoption of standard rates across the province. These were adopted to eliminate detailed accounting, the difficulty of relating supply centres to demand centres, and the desire to distinguish between "demand" and "energy" costs.

As nuclear energy developed in the late 1950s and early 1960s, concerns were raised about its safety. The selection of sites was therefore conditioned by social and environmental acceptance, technical factors (suitable foundation conditions, abundant cooling water), and economic and legal considerations.

For a variety of reasons, Ontario Hydro now prefers to develop energy centres with a capacity of at least 12,000 MW. Such a site has been established at Bruce and one is planned for Darlington. Hydro spokesmen have indicated that they see no reason for industry to locate near such sites, since power costs will be the same at any location in the province. It seems unlikely, therefore, that further development will take place near the "energy centres", despite extensive studies by the Ministry of Industry and Tourism of the potential of "energy parks".

More serious is the lack of any co-ordinated approach to regional planning by the province, which could indicate preferred sites to Ontario Hydro. Dean indicated that two of the most important planning ministries have quite different approaches:

> The Ministry of the Environment . . . has suggested an integrated approach to planning the power system including an outline of almost all factors. No other department has set out a similar co-ordinated approach, and no department appears to have a specific set of constraints or objectives which can be said to be criteria or guidelines for plant site selection.
>
> The Ministry of Treasury, Economics and Intergovernmental Affairs does not, at this time, have criteria relative to economic development in specific areas which are available as an input to the site-selection process. It does not presently regard either the site location itself, or the economics of the site location, as a particular incentive to its economic development plans.
>
> Until the environmental and socio-economic objectives of the various government departments are made more specific and can be injected into the process of site location, it is unlikely that the costs and benefits of the various objectives can be sufficiently identified to know whether site selection may be a positive factor in the economic development of the Province.[14]

It seems obvious that, in the words of Bossons, of the Ontario Economic Council, "The policy of providing selective infrastructure on a regional basis needs to reflect to a greater extent long-term strategic planning. Regional policy has not been as fully co-ordinated as it might have been with the other policy areas of immediate concern."[15]

The Use of Ontario Hydro Capital Spending for Contra-Cyclical Creation of Employment

The existence of a giant utility such as Ontario Hydro would appear to offer ideal opportunities for the creation of employment during slack periods in economic growth, and for cutbacks during periods of excessive growth. Hydro appears not to have modified its investment plans in any way designed to counteract provincial economic cycles, arguing that a change in the rate of spending can be expensive; that short-term adjustments could inhibit Hydro's ability to meet long-term demand and might therefore inhibit economic growth; and that reliability of long-term electricity supply is more important to provincial economic growth than any other objective.

Capital expenditures by Ontario Hydro are expected to rise from $900 million in 1975 to about $3 billion by 1980. As Hydro spends these massive amounts of capital, it shops for technical excellence, on the basis that this practice results in lower costs in the long run. Between 65 and 80 per cent of the material, equipment, and fuel are purchased in Canada, and between 55 and 70 per cent in Ontario. Hydro's choice of technology (nuclear, CANDU, heavy water) has led to heavy investment by certain Ontario industries – investment which in some cases will only be justified if the CANDU reactor begins to sell in volume to buyers outside Ontario. Yet, as Dean pointed out:

> Although the Design for Development plans of the Ontario Government in 1966 recognized that much of Ontario's Regional Development Programme would be accomplished [only] by a thorough-going co-ordination of the programmes, policies and spending of government departments and agencies; and that by providing the framework within which the private sector may build, direct public investment in services is a potent tool for development; there is, as yet, no formal identification in the Provincial Government, or Ontario Hydro, of the plans or the purchasing policies which require joint action in terms of regional development.[16]

Staff and Employment Practices and Their Impact on Economic Development

Ontario Hydro has 27,850 employees, with about 8,000 in the regions, 7,000 in operations, and 2,500 in design and construction. In addition, through sub-contractors, Ontario Hydro indirectly controls the employment of at least another 25,000 wage-earners in Ontario.

In general, Ontario Hydro salaries have been maintained in the upper range of those paid in major industries. Both salaries and benefits have been influenced by public-service settlements in recent years and are generally judged to be high in comparison with private industry.

The impact is felt particularly in the regions, where Ontario Hydro salaries are well above those of local industries competing with Hydro for labour. The result, in cases such as Bruce, is the attraction of labour away from local industry and a general upward pressure on wages, forcing the closing of most industries located in the primary impact area.

In general, Ontario Hydro is an exceptional employer, providing long-term security at high pay. It employs roughly 10 per cent of the construction tradesmen in Ontario. Curtailment of its growth will have a major impact on employment in the affected trades.

Ontario Hydro staff are now highly centralized in Toronto. It is likely that, as more generating sites are located away from population centres, and as the economic impact of Hydro's activities is fully recognized, Hydro will be pressed to decentralize its administration and maintenance staff to its energy centres.

Policy Guidelines for the Future

Clearly, the economy of Ontario is vulnerable in areas in which it has traditionally been strong. All known sources of cheap energy are developed, remaining sources of cheap labour (farms, immigration) are limited, and sources of cheap capital have vanished. The Government of Ontario must manage the economy to achieve maximum social benefits from the resources available to it. The following guidelines for action, suggested by John Dean in 1976, still appear sound:

1. Continue to encourage the production of electricity at the lowest cost commensurate with reasonable reliability of supply and financial viability.
2. Introduce marginal cost-pricing of power, so consumers can respond to price changes by reducing demand.
3. Develop Ontario Hydro's plans consistent with the long-term objectives of the Ontario economy; avoid short-term strategies.
4. Investment decisions should be sound, based on an adequate return on investment.
5. Social, economic, and environmental guidelines of government departments should be clear and consistent and should apply equitably to all industry, including Ontario Hydro, and should be reflected in the selection of sites for energy centres.
6. Because Ontario Hydro is a monopoly, and publicly owned, productivity and efficiency must be ensured by periodic external reviews, based upon a clear definition of Hydro's objectives and responsibilities.[17]

The Socio-Economic Impact of Ontario Hydro on Nearby Communities

For large energy parks such as Pickering, Nanticoke, Bruce, and Darlington, a large tract of land must be purchased; deposits of gravel found; rail lines laid out and built; a highly trained labour force of several thousand assembled for a period of at least five years; sewerage and water systems and housing planned and built; schools, hospitals, and fire and police services introduced to serve the expanded community; transmission corridors laid out and purchased and transmission lines built to the nearest load centre; and the entire project directed and financed.

During the building of such a temporary construction community, resources (food, timber, gravel, labour, capital) are diverted from traditional industries in the region to serve the needs of Ontario Hydro. A massive building programme is undertaken to create housing suitable for the Ontario Hydro labour force. Farmhouses and summer cottages are restored or fitted for permanent occupancy; new apartments, row houses, and other types of housing suitable for an urban labour force are created. Local wage rates are forced upward to levels similar to those of Hydro and industries unable to pay such rates are forced to close. Local municipalities are forced to take on a broad range of new activities, yet

Ontario Hydro does not pay local taxes based on the assessed value of its property. The price of goods and services moves to urban levels.

The extent of these effects and their impact depend largely on the degree of urbanization at the time of Ontario Hydro's arrival in the area, and the extent to which local wage and price levels approximate those of Toronto. They are most severe in rural areas such as Nanticoke and Bruce and least severe at semi-urban locations such as Pickering.

Selection of Sites

Ontario Hydro's site-selection process has traditionally focused on technical requirements, such as suitable foundation conditions, substantial volumes of cooling water, and, in the case of coal-fired plants such as Nanticoke, a suitable location for a harbour. It appears that little attention has been paid to socio-economic impact at the generation site, or to the issues involved in locating the necessary transmission facilities to convey power to the nearest major load centre.

Future requirements must be anticipated far enough in advance to permit lead time for public participation, government approvals, property acquisition, design of lines and facilities, construction, and testing. The result of the lengthening and complication of each of these stages is the extension of the lead time from six to 12 years for the siting of a large power plant. Ontario Hydro's load forecast provides the signal that electrical demands of the province will, in 12 to 15 years, require new generating and transmitting facilities. If a suitable site has been acquired in Ontario Hydro's land-banking programme, it is identified as a potential generation centre. If not, a new site is chosen on the basis of technical considerations.

As the location of the new site and the timing of the development become clearer, the public may be notified by newspaper articles, public meetings, and through press releases and information centres. Ontario Hydro conducted a series of planning seminars during the summer of 1975 to provide interest groups and government ministries with an opportunity to learn about the methods Hydro uses in selecting sites and transmission corridors. At these meetings, Ontario Hydro maintained that it takes into consideration rural and urban development patterns, industrial activity, transportation systems, agriculture, parks and recreation, special areas of interest, general population distribution and labour force composition, and waterways.

While these considerations are being taken into account in the late 1970s, they were not involved in the selection of sites at Nanticoke and Bruce. These sites appear to have been chosen on purely technical grounds, having to do with the abundance of cold water for efficient cooling and the security provided by distance from urban areas.

The Bruce and Nanticoke sites, in particular, have been located in good agricultural areas and necessitate the construction of long transmission lines across choice Ontario farmland. Ontario Hydro offered below-market prices for affected lands and properties in its early negotiations. As a result, the route selection for these lines has been delayed by several years, as affected citizens have fought against Ontario Hydro's plans and have suggested alternative routings. Even though the cost of hearings has not been significant in relation to the cost of the plants themselves, the delays involved in the extensive hearing process and the loss of delivery of power to the market have cost Ontario Hydro immense sums of money.

The following case studies of the Bruce and Nanticoke developments are provided as illustrations of the problem. A more detailed review is included as Appendices A and B. The appendices include reference to procedures in use in the U.S. and, in particular, in the Tennessee Valley Authority, a utility comparable in size to Ontario Hydro.

The Socio-Economic Impacts of Energy Projects on Nearby Communities

The Bruce Nuclear Development (see Appendix A)

The Bruce Nuclear Power Development is located in Bruce County, between Kincardine and Port Elgin. Ontario Hydro worked closely with AECL from 1958 onward, first to develop the small Douglas Point station and later to plan and construct four heavy-water plants and the Bruce "A" and "B" power plants.

The area was extremely rural. Port Elgin and Kincardine, the largest towns, had an original population of about 1,800 each. Incomes were low (below $3,000 per capita in 1965) and local industries were based on furniture and wood products manufacturing and on agriculture and tourism.

The arrival of Ontario Hydro, with its highly trained executive and engineering staff, its large engineering sub-contractors, and its demand for wide-ranging social services and physical facilities, has transformed the area (see Figure 4.1). Both Port Elgin and Kincardine have grown to over 6,000 and smaller places in that area have more than doubled in population. Local councils were largely replaced by Ontario Hydro employees. Capital expenditures soared from less than $200,000 per year in Port Elgin and Kincardine combined to well over $2,000,000 per year by the late 1970s. Policemen, firemen, social service staff, and schoolteachers have been added to deal with the explosive growth. Businesses have expanded rapidly to handle local retail trade. Traditional industries have almost vanished as a result of high-wage competition from Ontario Hydro. (Wages at BNPD averaged over $25,000 per worker in 1979.)

Fig. 4.1: p. 46

Ontario Hydro, in 1973, commissioned M.M. Dillon to make a major study of social and economic impacts on communities in the Port Elgin-Kincardine area (see Tables 4.1, 4.2, and 4.3; pp. 40-45). This study forecast that the "gross impacts", or direct costs to local communities, as a result of the BNPD would amount to $5.5 million up to 1978 and $9.6 million from 1978 to 1984, when the construction labour force will leave the area. A similar study, conducted at the same time by Dr. Norman Pearson, estimated the impacts at about $24 million. Neither study has been updated to determine actual impacts of the project.

To date, the capital investments of local municipalities for sewers, water systems, schools, and other facilities have been considerably greater than the Dillon forecasts.

The project has been modified by the decision to mothball one-half of the third heavy-water plant and not to complete the fourth plant. The final two units of Bruce B will be delayed by two years, thus stretching out the construction period to 1986. Nevertheless, it is obvious that the dependency of the local communities on Ontario Hydro wage income has been increased, and that the winding-down period, down to a total of about 3,000 maintenance and operating employees, will be extremely painful. Port Elgin and Kincardine will each shrink from over 6,000 to about 4,000 unless action is taken to expand their industrial employment base.

Treatment of local communities by Ontario Hydro contrasts sharply with experience in the United States, where annual impact statements must be filed with government, and mitigation payments made to cover the costs of expanding infrastructure, to provide additional police, fire, and education services and to pay off outstanding debentures. The Tennessee Valley Authority, for example, would expect to pay about $24 million in mitigation payments on a project the size of Bruce. Ontario Hydro has paid about $5.5 million in impact payments to date, which is far short of what appears to be the full socio-economic cost to the communities.

Ontario Hydro has, however, agreed to pay all such costs in the case of the Darlington Nuclear Project. Careful negotiations by the municipality have resulted in a much more favourable arrangement, in which the municipality of Newcastle will be saved from or at least compensated for negative impacts resulting from plant construction.

Although an Industrial Development Committee has been set up at Bruce to attempt to bring industry to the area, Ontario Hydro has been reluctant to make firm commitments with respect to the provision of surplus steam or low-cost power. If local labour now expects Hydro wage levels, it can be expected that other industries will give the area a wide berth for the foreseeable future. Perhaps the best prospect for local development is the proposed greenhouse development and fish hatchery, which would use waste heat from the BNPD, and could employ up to 100 workers. It remains with local officials to find employment for the 5,000 workers to be laid off from the BNPD project by 1985. Unless this is done, the communities will suffer drastic economic decline.

The Nanticoke Coal Station (see Appendix B)

The Nanticoke site, on the north shore of Lake Erie, is ideally located near rail and truck transportation, with port facilities close to U.S. sources of coal, and accessible to Ontario's major urban markets. It is often suggested (although not by Ontario Hydro) that the simultaneous selection of the site by Ontario Hydro (for its coal-fired station), by Texaco Canada (for a major refinery), and by the Steel

Company of Canada (for plant expansion) indicates that massive industrial growth can be expected near Ontario energy centres.

On closer examination, it is clear that Texaco and Stelco chose the site for its transportation and market advantages and not because of the Ontario Hydro power plant. At the same time, the development of a new city of 200,000 at Townsend, near the site, has not progressed as expected.

The Nanticoke complex has pre-empted some of Ontario's best farmland and has yet to prove the ability of large energy centres to attract industry.

The Concept of a Combined Energy Centre

A study was commissioned by the Ministry of Industry and Tourism to determine whether the proposed North Channel Power Plant could serve as the focus for concentrated industrial development east of Sault Ste. Marie. The area is not of high value for agriculture, and an energy facility could provide waste heat for homes in a new city, which could be sited in an attractive recreational area, with all modern facilities. The site is served by road, rail, and harbour facilities.

Results of the study were inconclusive. It appears unlikely, however, that the mere existence of a large power plant would in itself be a sufficient incentive to bring industry to the area (see Appendix C).

Northern Ontario: A Special Case?

The population of northern Ontario is declining as a percentage of the population of the province, despite high native birth rates. Because the region is characterized by large mining and pulp and paper operations with populations clustered in resource towns in the south and in small native communities in the north, there is little capacity to absorb poorly trained additions to the work force, and well-trained northerners tend to migrate to other parts of Canada. Mechanization in the mining and forest industries and on the railways has meant a decline in the number of jobs. Further development seems to centre on the tourist industry, on alternative life-styles, and on wages and salaries related to community self-management activities.

Employment and service-delivery problems are particularly acute among the native population north of 50° North, where about 20,000 native people are scattered over half of the area of the province in communities ranging from 50 to 3,000 people.

The region is currently characterized by growing unemployment, extreme environmental and social sensitivity, cultural and linguistic differences, and increasing hostility between white and native groups.

The potential labour force in northern Ontario as a whole will grow by 118,000 between 1971 and 1986 and even faster thereafter as those born during the period of high native birth rate of the last two decades reach the working age. Above 50° North alone, this implies a need for 6,000 new jobs, which would require five mills the size of the proposed Reed Paper complex at Ear Falls, or 15 mines the size of the UMEX Mine at Pickle Lake. Since it is clearly impossible, given present social and environmental constraints, to create even a small proportion of these jobs, an entirely different form of economic and social organization is required or a massive migration out of the area must be expected.

An alternative strategy for the region would involve the development of appropriate labour-intensive technologies, geared to the development of a more modest standard of living, but suited to the unique cultural and environmental characteristics of the region. Arts and cultural centres, interactive local communication systems, community origination of essential services such as housing, land development, tourism, lumber and mineral production, and the development of trapping, fishing, wild-rice harvesting, and local agriculture might all be elements in such a strategy. The smaller and more isolated the communities, the more appropriate these alternatives appear to be, if such communities are to persist and to offer a satisfactory life-style for years to come.

The primary resource industries now employ about 85,000 people, or 29 per cent of the total work force in the region. About 70,000 of these jobs are directly dependent on the maintenance of the resource base. It now appears that the forestry resource base is shrinking steadily and that many mills will not be replaced when the forests are depleted, which will happen before the end of the century.

These industries contribute enormously to Canada's balance of payments, despite the relatively few

jobs they provide in the area. Pulp and paper is Canada's largest single export, accounting for one-ninth of all exports. Few imported inputs other than machinery and equipment are needed for either forestry or mining.

Large parts of northern Ontario have no touristic future and few resources. Local, traditional occupations are likely to remain the basis for any true local productivity.

Changes in resource taxation laws in 1972 have led to a situation where no new mines are now planned in northern Ontario. The cost of finding a new mine is estimated at $30 million and is increasing rapidly. Exploration expenditures in Ontario have dropped from about $23 million per year in 1967-71 to $14 million per year in 1972-6. At the same time, mining prospects in other parts of the world and on the seabed are becoming more attractive. The result is that mining in Ontario has fallen from 6 per cent of provincial product in 1961 to 4 per cent in 1974, and it continues to decline.

Because most northern Ontario industries are heavy users of energy, and because more commercial and residential energy is needed per capita to create a comfortable winter living environment, development in the region is heavily dependent on the network of gas pipelines and high-voltage transmission lines. Any new industrial developments will require extensions of the present network.

The creation of these energy corridors has, until recently, been undertaken with little consideration of social and economic impacts on native peoples, wildlife, or natural vegetation, since the area is vast in relation to the land required for the generating sites and corridors.

In earlier times, energy was generated at the site of the mine or mill, often from hydraulic sources, and the surplus was used to serve the local community. No corridors were needed. The earlier pattern may be worth considering for isolated sites, or where corridors would cause serious dislocation of people or the environment. Small hydraulic generators may be suitable for serving clusters of native communities and would offer the advantages of low operating cost and some local employment.

Northern Ontario is the source of substantial amounts of energy for the rest of the province, including hydroelectric power, uranium, and, potentially, wood, and under conditions of sustained-yield management of forest resources could make a still larger contribution. Wood wastes are being used for local power generation; methanol production from forest plantations may be feasible within this century and the Onakawana lignite deposits could provide power to the provincial grid.

For local use, the solar-power potential appears to be superior to that of many parts of the province, since winter cloud cover is less than in the south. Wind power may be an option in the Hudson Bay lowland, where constant wind velocities of from 20 to 30 km per hour are experienced for much of the year.

There is potential hydroelectric capacity of over 3,000 MW on the Albany and Severn river systems, which could provide a substantial contribution to the provincial power grid, if social and environmental consequences can be taken into account.

Oil and gas reserves have been identified in the Hudson Bay and James Bay lowlands and nearly 2 million hectares of land remain under lease to energy companies. The discovery of natural gas near isolated communities would obviously provide a valuable alternative source of energy.

The Royal Commission on the Northern Environment stated, in its preliminary report:

> In order to conserve the northern part of the province as a place to live, northerners must have a say in its development. It is likely that most Ontarians do not recognize that their life-style and standard of living are due in substantial part to the people and resources of Northern Ontario. There is an unequal interdependency in this province which is being questioned by northerners and which must be brought out and understood before it can be altered.[18]

That Royal Commission called for "the evolution of new techniques of participation to allow the people of the north to take a full role as citizens". Otherwise, it warned: "The alternative is to impose an arbitrary, comprehensive blueprint for development. What is being suggested is the development of an orientation away from centralized forms of social control and decision-making into experimentation with forms that are decentralized and community oriented."[19]

Ontario Hydro serves northern Ontario by means of its East System, which serves northeastern Ontario, as far west as Wawa, and its West System, which serves the rest of the area, to the Manitoba border.

Large projects forecast for the East System before the year 2000 include the Onakawana lignite

development and the North Channel nuclear station. New projects in the West System include the completion of the Thunder Bay fossil-fuel plant extension, the Marmion Lake (Atikokan) fossil-fuel plant, and the high-voltage link between the East System and the West System.

Lower growth rates in northern Ontario, together with the use of local sources of renewable energy, may make the construction of the new plants unnecessary until the year 2000, particularly if the interconnecting power line between the East System and the West System is completed and if additional low-cost hydroelectric capacity continues to be made available by Manitoba Hydro.

Summary

Development and Planning in Ontario

Ontario has been going through profound social, economic, and cultural changes, towards a growing consciousness of the natural environment and concern with the consequences of urban development; concern that foodland be preserved and that rural land be treated as a natural resource rather than a resource for urban use; concern for public involvement in the making of planning decisions; and an emerging concern for the energy consumption implications of urban development decisions.

These concerns have led to a controversy between growth and non-growth philosophies and to the belief that planning should be made more responsive to the needs of people.

At the same time, urban development densities have been increasing, changes have been taking place in urban social structure, urban economic activities are being decentralized, and rural communities are being depopulated by farmers and repopulated by urban residents for recreational and residential purposes.

There has been profound change in the structure, organization, and financing of municipal government and in the provincial role in local government affairs. There has been a sharp increase in the share of municipal costs financed through provincial transfer payments.

These changes have reflected the provincial government's growing intervention in local government affairs, which has included the intermittent imposition of provincial planning policies of one kind or another.

However, conditions of rapid growth that have prevailed since World War 2 will give way to much slower growth rates, reflecting the maturing of the post-war baby boom and the desire for smaller families.

Lower rates of growth will cause stresses as expectations are not met, particularly in regions such as the north. This may increase the demand for government intervention in those areas.

Ontario's role as Canada's industrial centre may change as energy costs continue to rise. Heavy investments will be needed to overhaul traditional industries and to augment the dwindling stock of natural resources in forestry and agriculture.

Existing and planned regulation, through the Planning Act, the Environmental Assessment Act, the Niagara Escarpment Act, and other legislation, is causing concern among municipal leaders and investors in agriculture and industry.

Provincial priorities may require reassessment, in view of declining rates of growth in industry, rising unemployment, especially in the north and in small towns, and the growing share of provincial capital that is being channelled into Ontario Hydro.

A more open style of planning has come into effect in Ontario. The RCEPP, the Select Committee on Hydro Affairs, the Hartt Commission, the Eldorado nuclear hearings, the Solandt Commission and other efforts to obtain public participation have raised the expectation that major shifts in policy will be accompanied by extensive public dialogue. Such efforts at public involvement have come to be regarded as an essential prelude to any major public policy changes.

Ontario Hydro's Role in Ontario Planning

Ontario Hydro's planning process seems to follow the province's objectives of meeting forecast demand at lowest feasible cost as a reliable supplier. Limitations on available capital make it essential to ask such questions as these: How much demand will be met, and at what level of reliability? What trade-off

of capital and operating costs is realistic? How will the economy be protected against inadequate supplies of energy? What is Ontario Hydro's role in meeting the province's total energy needs?

Ontario Hydro's role as an economic development tool of the province has been a passive one, as a result of its mandate to supply electricity at cost. Both changes in demand levels and the nature of alternative supply sources could alter the role of electricity supply in economic development. Unless there is an assurance of alternative supplies of energy at a reasonable cost, the electricity supply industry must be the basis of Ontario's energy strategy.

In the event that Hydro should be required to support regional development or contra-cyclical construction policies, the additional costs should not be built into power prices but should be borne by subsidy from the provincial treasury.

Ontario Hydro has been autonomous to a degree that has made it unresponsive to broader social demands and expectations, an attitude that may have been appropriate in the past but is probably inappropriate in an environment of rising costs, shortages of capital and energy, and extensive environmental pollution.

Development of electric power in Ontario has been seen as a means of attracting industry to Ontario and freeing it from dependence on U.S. coal. The goal was power at cost, to provide a base for industry that would be competitive with the U.S. The availability of unrestricted hydroelectric sites, capable of low-cost power generation, made this policy work. Recent moves to more expensive fossil and nuclear plants make it necessary to review the policy.

Ontario Hydro disbursements are about 25 per cent of the combined annual disbursements of the Ontario government. A shift in Hydro's expenditures can, therefore, have a powerful effect on economic growth in Ontario.

Task Force Hydro recommended that Hydro should be a delivery agency of the provincial government receiving broad policy direction from the government through the Provincial Secretary for Resources Development. It also recommended that Hydro actively participate in the development and support of government policies with respect to energy and the environment; that marketing policy be designed to support provincial energy and environmental policy; and that there be close co-ordination between Hydro and the province with respect to economic development objectives.

Ontario Hydro does not appear to have changed any of its policies to bring them into line with the above recommendations. Ontario Hydro's budgets have been climbing at the rate of about 30 per cent per year, while the Ontario Government budget has been rising at only 15 per cent per year, over the last five years. This has focused very large amounts of capital on specific Hydro projects, and may have siphoned investment capital away from other priority activities of the government.

The adoption of province-wide uniform power pricing means that electricity costs can be left out of location decisions, provided that continuity of supply can be guaranteed. Ontario Hydro has focused on continuity of supply rather than price.

Although the Design for Development plans of the Ontario Government in 1966 recognized that much of Ontario's regional development programme would be accomplished only by a thoroughgoing co-ordination of the programmes, policies, and spending of government departments and agencies, there is as yet no formal identification in the provincial government, or in Ontario Hydro, of the plans or purchasing policies that require joint action in order to support regional development.

Ontario Hydro has nearly 28,000 employees, with 8,500 in the regions, 7,000 in operations, and 2,500 in design and construction. In addition, through sub-contractors, Hydro directly controls the employment of another 25,000 wage-earners in Ontario. Salaries are now negotiated centrally and do not take into account regional or local differences in wage rates. The result, in rural areas such as Bruce, has been the attraction of workers away from local industry and strong upward pressure on wages. In the case of Bruce, most local resource-based industries have been forced to close during the 10-year construction period.

The Ontario Hydro staff is highly centralized in Toronto. It appears that substantial decentralization is possible without great loss of efficiency, to the advantage of smaller cities and towns.

Because Ontario Hydro is a monopoly (there is no competition by which to judge its performance), its productivity and efficiency must be verified by periodic (or continuous) external reviews, based on a clear definition of Hydro's objectives and responsibilities.

Socio-Economic Impact of Ontario Hydro on Small Communities

Because of their large size and the large and diversified labour force they require, Ontario Hydro nuclear construction projects have substantial local impact. Housing must be constructed and services furnished for up to 8,000 workmen and their families; rail lines must be built; service industries must be established; and arrangements must be made for construction sub-trades, primary and secondary education, social services, and churches. At the end of the construction project, only a small and highly specialized work force is required to operate the plant.

In the absence of an existing urban infrastructure, capable of absorbing the impact of such large construction projects, a full range of services must be furnished for the life of the project and then dismantled or turned to other uses. The Bruce project, as the first and largest of its kind, provides a useful indicator of the scale of this problem.

Nuclear sites are chosen not because of future economic development potential, but for suitable foundation conditions, the availability of abundant cooling water, and other technical requirements. Ontario Hydro maintains that there is no likely relationship between the existence of a large nuclear (or fossil) facility and the development of significant local economic activity. Since power rates are equalized across the province, there is no economic advantage to being close to a generating station.

Locating large stations far from the demand centres necessitates high-voltage power lines over farmland. There has been increasing resistance to the encroachment of such lines on farms despite the adoption of more adequate compensation policies.

Although Ontario Hydro conducted studies to determine the probable future economic impact on communities affected by such projects, promised monitoring studies of actual impacts have not been done.

However, there has been no effort to measure longer-term local impacts on the communities affected, as the construction period comes to an end. Nor has a firm commitment been made to the mitigation of these effects.

Discussions with other agencies (TVA, PASNY) indicate that mitigation payments to local municipalities for projects on the scale of Bruce would amount to over $20 million, to alleviate the full impact of withdrawal of the labour force, to develop a sustained economic base for the remaining population, and to pay off outstanding debentures for installations that were needed for the construction period but are oversized for the long term.

The Ministry of Industry and Tourism, in connection with the proposed North Channel site for a future nuclear complex, has been investigating the principle of establishing "combined energy centres". Such centres would attempt to site future large energy plants in areas where foodlands would not be affected, where industrial opportunities could be identified, where the advantages of large blocks of dependable power could be fully exploited, and where uses could be found for waste heat discharges.

It is possible that combined energy centres are a key to Ontario's industrial future. Expensive oil could price Ontario manufacturers out of world markets. Bulk power and abundant and cheap waste heat will become more and more attractive to major industries. Bruce is clearly the place to test the idea, since energy is available; the towns have been expanded and part of the necessary labour force has been assembled. The province should support local efforts to develop a major industrial park at Bruce to test the workability of the combined energy centre concept.

Table 4.1 Employment Impact

	Situation before establishment of B.N.P.D.	Changes since the establishment of B.N.P.D.	Projections on the basis of B.N.P.D.'s future plans	The extent to which changes can be attributable to B.N.P.D
Bruce County South	• The traditional sources of employment have been agriculture, service, tourism, and resource based industries. • No industries expanding rapidly.	• Influx of workers from outside area. • Attraction of workers from other industries within area to B.N.P.D. • Increase in wage rates. • Aggravation of the imbalance between job opportunities for males and females. • Stimulation of service employment opportunities.	• A more rapid rate of in-migration of workers as local labour pool is fully utilized. • Further increases in wage rates. • Further imbalances between male and female job opportunities. • An out-migration of construction workers after the peak. • Further increases in service employment opportunities.	• The in-migration of workers is directly related to job opportunities at B.N.P.D. • The increase in wage rates is partially due to the higher rates at B.N.P.D. and partially related to general inflationary trends. • The trend towards greater imbalance in male/female job opportunities in totally related to B.N.P.D.
Town of Kincardine	• Declining labour fource in manufacturing sector between 1961 and 1967 from 400 to 200 persons. • Manufacturing plants closed in this period. • Remaining industries are related to wood, dairy and other agricultural products.	• From 1967 to 1973 a further decline in manufacturing employment of 20 persons and further closures of plants. • Increased wages put strain on marginal operations. • Construction industry active. • Service employment increased.	• Stable situation in manufacturing sector. • Increases in service employment. • B.N.P.D. will become principal employer. • Plans exist which indicate a further expansion of service employment.	• Increased wage rates as a result of B.N.P.D. have accelerated the closure of marginal operations likely to close in any event. • Expansion of employment in the service sector is related to B.N.P.D., increasing tourism and general trends in consumer expenditure.
Town of Port Elgin	• Employment in manufacturing stable. Manufacturing light industrial, dairying and wood products. • Employment in the service sector was steadily growing. • Tourist related employment was gradually expanding.	• No changes in employment levels have occurred since B.N.P.D. began. • Competition for labour has been keen. • A rapid increase in service employment of 12% per annum occurred between 1968 and 1973. • Tourist related employment has stabilized.	• Further expansion of service employment is expected. • The stable situation in the manufacturing sector will continue. • Tourist related employment will remain static. • A higher proportion of employment opportunities will be related directly and indirectly to B.N.P.D.	• Expansion of service employment is directly related to B.N.P.D. • The static situation with tourist related employment is related to B.N.P.D. and utilization of tourist accommodation by workers.
Town of Southampton	• Only four manufacturing industries with more than ten employees. Furniture and pottery are the principal products. • Employment levels have been stable. • Service employment was slowly increasing. • Tourism related employment was significant for the Town.	• No major changes in employment levels in manufacturing have occurred but one plant has closed. • Service employment has increased a small amount. • Tourist related employment is stable to declining.	• No significant expansions of service employment. • A static situation for tourist related employment. • A higher proportion of job opportunities will be related directly or indirectly to B.N.P.D.	• Expansion of service employment directly related to B.N.P.D. • The static situation for tourist related employment is related to B.N.P.D. and the utilization of tourist accommodation by workers.
Town of Walkerton	• Industrial base relatively strong and diversified. • Service employment slowly expanding in line with general trends.	• No change in general trend. • Individual instances of labour shortages in construction sector.	• No change in trend except for more active competition for labour by local industries.	• Future intensified competition for labour will be related to B.N.P.D.
Village of Paisley	• No manufacturing industry. • A small number of employees in the retail sector.	• Individual problems in getting qualified employees in service sector.	• A minor expansion of service employment probable, utilizing female labour.	• The changes that have and will occur will most likely be related to B.N.P.D.

Table 4.1 Employment Impact (continued)

	Situation before establishment of B.N.P.D.	Changes since the establishment of B.N.P.D.	Projections on the basis of B.N.P.D.'s future plans	The extent to which changes can be attributable to B.N.P.D
Village of Ripley	• No manufacturing industry. • A small number of employees in the retail sector.	• Increase in local sales but no increase in employment.	• A minor expansion of service employment.	• The changes that have and will occur will most likely be related to B.N.P.D.
Village of Tiverton	• Small scale service employment.	• Small expansion of employment.	• Small scale expansion of service employment.	• The majority of any expansion in employment opportunities can be related to B.N.P.D.
Township of Bruce	• Traditional economic base agriculture and tourism. • Number of farms declining. • Little retail employment.	• Labour attracted away from the farms. • Expansion of employment for sand and gravel excavation. • No expansion of retail employment.	Employment in farming likely to decrease.	• The major change has been with respect to farming activity and the lower amount of labour involved in agriculture. These changes have been partly related to the general trend which has been accentuated by opportunities at B.N.P.D.
Township of Huron	• The major employers are tourism, agriculture and agriculture related enterprises. • Almost 50% of labour force employed in agriculture.	• Labour attracted away from the farms. • Prefabrication plant closed.	• Further declines in farming employment. • Small expansion of service employment.	• The major change has been with respect to farming activity and the lower amount of labour involved in agriculture. These changes have been partly related to the general trend which has been accentuated by opportunities at B.N.P.D. • Close of prefabrication plant directly related to competition with new plants attracted by B.N.P.D.
Township of Kincardine	• Major employers were agriculture and tourism. • Retail employment stable.	• Decline in farm employment. • Expansion of employment in gravel and sand industry. • Stable situation with respect to retail employment.	• Further declines in farm employment. • Small expansion of service employment.	• The major change has been with respect to farming activity and the lower amount of labour involved in agriculture. These changes have been partly related to a general trend which has been accentuated by opportunities at B.N.P.D.
Township of Saugeen	• Major employers were agriculture, tourism and retail sector. • Stable employment levels in all except agriculture which was declining.	• Decline in farm employment. • Expansion of employment in service sector.	• Further declines in farm employment. • Further expansion of service employment on a small scale.	• The decline of farm employment is aggravated by land being taken for other uses around urban centres and along the highway and this is partially related to B.N.P.D. • Expansion of service employment is related to B.N.P.D. and tourism.

Table 4.2 Population Impact

	Situation before establishment of B.N.P.D.	Changes since the establishment of B.N.P.D.	Projections on the basis of B.N.P.D.'s future plans	The extent to which changes can be attributable to B.N.P.D
Bruce County South	• Total population was static with an annual average increase of 0.5%. • Substantial out-migration in the 20 to 44 age bracket. • Lower than average percentage of population in 20 to 44 age bracket.	• Total population increase annual average, 1966 to 1973 4.0%. • In-migration in the 20 to 44 age bracket. • Increase in population of working age.	• Accelerated population increase to 1978 at average annual rate of 6.0%. • Decline after 1978 peak of 56,000. • More balanced age profile.	• It is estimated that 70% to 75% of new population growth in Bruce South to 1978 can be attributed to B.N.P.D.
Town of Kincardine	• Total population was static with an annual average growth rate of 0.2%. • Substantial out-migration. • Major declines in 1965 and 1966.	• Accelerated increase for 1968 to 1973 of 3.7% per annum. • Influx of workers in 20 to 44 age bracket.	• Continued accelerations in population growth to 1978 at 16% per annum. • Decline after 1978 peak of between 5,000 and 7,000 to approximately 4,000. • More balanced age profile.	• It is estimated that 85% to 95% of new population growth can be related to B.N.P.D. A large proportion of operation staff are expected to live in the Town.
Town of Port Elgin	• Population growing at 1.5% per annum. • Strong growth in 1962 to 1964 trailing off in 1965.	• Accelerated population increase, 1966 to 1973, 7.2% per annum. • Influx of workers in 20 to 44 age bracket, an increase from 24% to 32% of total population between 1961 and 1971.	• Continued acceleration in population growth to 1977 of 27% per annum. • Decline after 1978 peak of between 6,000 and 9,000 to 5,000. • More balanced age profile.	• B.N.P.D. is estimated to account for 85% to 95% of new population growth to 1978. A large proportion of operations staff from B.N.P.D. are expected to live in the Town.
Town of Southampton	• Total population was static with an annual growth rate of zero between 1961 and 1966. • Major declines in 1965 and 1966.	• A small population increase of 1.2% per annum 1966 to 1973. • In-migration of younger workers.	• An acceleration in population growth as services become available at 12.0% per annum to a peak of between 2,500 and 3,800 in 1978. • A decline after the peak to approximately 2,270. • A more balanced age profile.	• From 80% to 90% of new population growth to 1978 can be attributed to B.N.P.D.
Town of Walkerton	• Population had been steadily increasing at 1.7% per annum.	• There has been no change in the rate of growth since the advent of B.N.P.D. but from 1967 to 1973 B.N.P.D. has been responsible for approximately 40% of new population growth.	• An acceleration to a population growth rate of 4.0% per annum to a peak of approximately 5,600 in 1978 and a moderate decline to 5,400 in 1984. • Very little change in the age profile.	• It is estimated that 45% to 55% of new population growth can be attributed to B.N.P.D.
Village of Paisley	• Population in Paisley had been declining at 0.5% per annum.	• An increase in population of 3.5% per annum occurred between 1966 and 1973 but there is still a high proportion in the over 65 age bracket.	• An accelerated rate of growth at 11% per annum to a peak of between 1,100 and 1,200 in 1978 declining to approximately 950 by 1984. • A reduction in the average age of the population.	• It is estimated that from 80% to 90% of the growth can be related to B.N.P.D.

Table 4.2 Population Impact (continued)

	Situation before establishment of B.N.P.D.	Changes since the establishment of B.N.P.D.	Projections on the basis of B.N.P.D.'s future plans	The extent to which changes can be attributable to B.N.P.D
Village of Ripley	• Population had been declining at an accelerating rate between 1951 and 1966 at 0.6% per annum. • Major declines occurring in 1965 and 1966.	• Between 1966 and 1973 the population increased at 3.5% per annum which is only partially due to B.N.P.D.	• A continued acceleration in population growth to 1977 of 14.0% per annum. The population to peak in 1977 at between 600 and 950 persons and decline to approximately 500 in 1984.	• It is estimated that from 80% to 90% of the new growth in the Village will be due to stimulus from B.N.P.D.
Village of Tiverton	• A fluctuating population with an underlying growth trend of 2.5%. • Strong growth in the early 1960's, decline in 1964 and 1965.	• A dramatic increase unequalled in any centre in the area to 9.0% per annum between 1966 and 1973. A similar change in the age group from 23.0% to 31% of the total population.	• A substantial increase of 18.0% per annum to 1977 with a peak population of between 1,000 and 1,300 declining to approximately 800 in 1984. •Service capacity places the major restraints on this community.	• It is estimated that 90% to 95% of the new population growth in the Village will be due to stimulus from B.N.P.D.
Township of Bruce	• The population had been static to declining with an average rate of decline of 0.5%.	• An increase has occurred between 1966 and 1973 to 5.0% per annum.	• The increase is expected to accelerate to 6.6% per annum and the population will climb close to 2,100 by 1978 then decline to 1,700 by 1984.	• From 80% to 90% of this growth will be related to B.N.P.D. growth factors.
Township of Huron	• Between 1951 and 1966 the population had been static to declining, with an average rate of decline of 0.4%.	• Between 1966 and 1973 the population increased at 3.0% per annum but some of this can be attributed to people retiring to the area.	• The population growth of the last few years will continue at a similar annual rate of 3.5% resulting in a population peak of 2,000 declining to approximately 1,700 by 1984.	• From 70% to 80% of the short-term population increase can be related to B.N.P.D. stimulus.
Township of Kincardine	• Between 1951 and 1966 population was static with an annual increase of 0.3%.	• Between 1966 and 1973 the population growth accelerated sharply to 7.0% per annum and it appears that much of this growth was a direct consequence of B.N.P.D.	• The annual growth rate is expected to accelerate to 12.0% to 1978 when the peak population will be between 3,500 and 3,800 and then decline to approximately 2,600 by 1984.	• B.N.P.D. is expected to cause from 80% to 90% of the population growth until after the construction peak.
Township of Saugeen	• Between 1951 and 1966 the population was static to declining with an annual average decline of 0.6%. • An almost constant decline occurred between 1959 and 1966.	• Between 1966 and 1973 the population growth accelerated to 3.4% per annum of which close to 95% can be related to B.N.P.D.	• The growth rate is expected to accelerate to 10% per annum to 1978 when the peak population will be between 1,500 and 1,700 persons. By 1984 it is expected that the population will drop back to 1,200 persons.	• B.N.P.D. is expected to account for 85% to 95% of the population growth until after the construction peak.

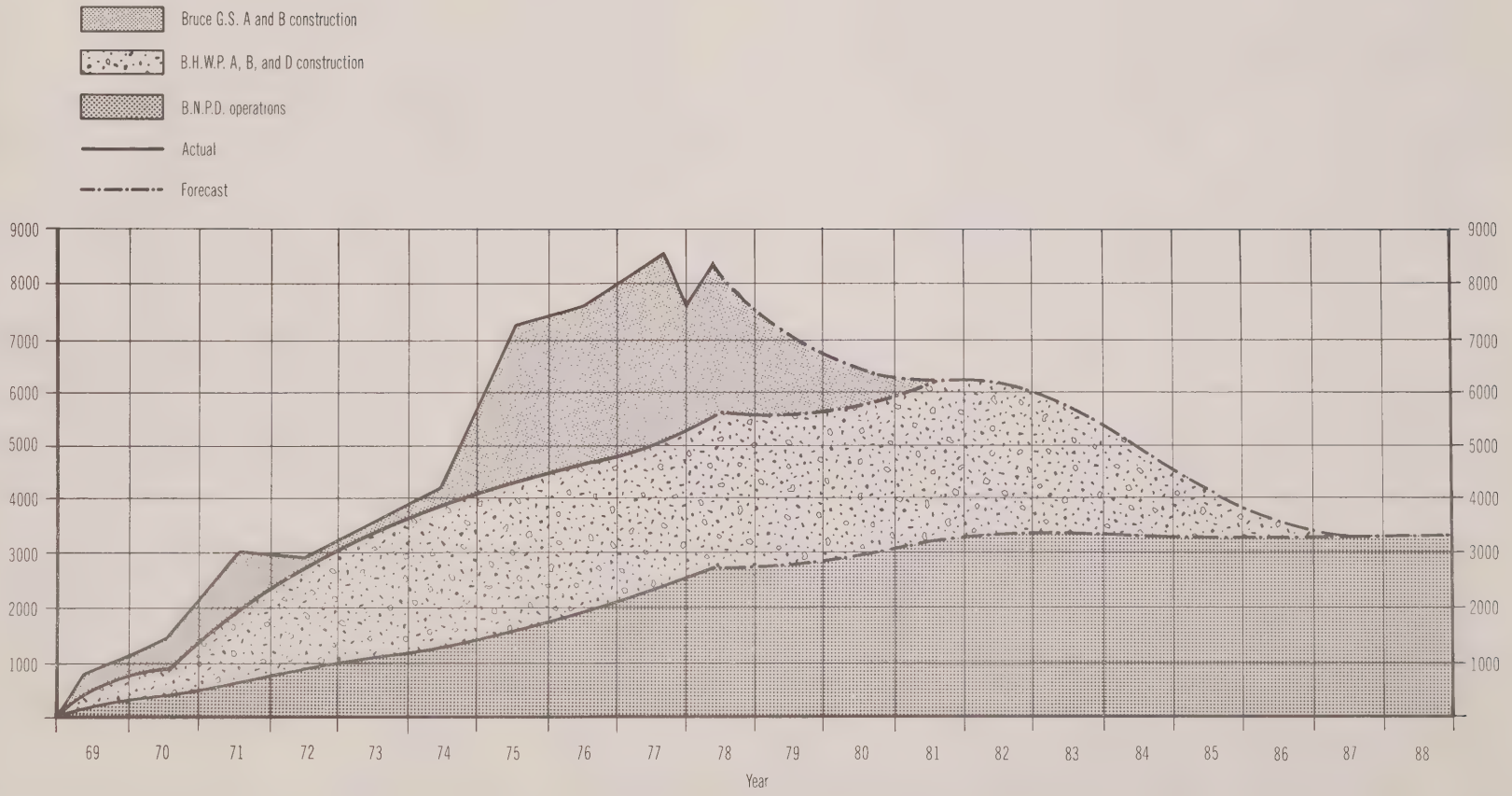
Table 4.3 Housing Impact

	Situation before establishment of B.N.P.D.	Changes since the establishment of B.N.P.D.	Projections on the basis of B.N.P.D.'s future plans	The extent to which changes can be attributable to B.N.P.D.
Bruce County South	• Low level of demand. • Prices stable. • Low rate of conversion from cottages to permanent residences. • Principal demand resulting from farmers moving to Towns and Villages. • Units built mainly single family. • Housing stock generally old and well maintained.	• Housing starts have accelerated since 1968. • The majority of units have been single family but with a trend towards more multi family dwellings in recent years. • The construction of senior citizen accommodation has increased. • Cottage starts have declined in the towns but increased in the lakefront townships. • Conversion of cottages has increased.	• Up to 3,000 new households are expected to be established in the area between 1973-1977. • The demand for units other than the single family type will increase. • A wider range of housing types and prices will be demanded in the future. • Conversion of cottages will continue. • A utilization of residential units as tourist accommodations after the peak demand is probable.	• A rapid increase in demand for owner-occupied and rental housing is attributable to B.N.P.D. It should be recognized that declining family size and increased wealth leads to a demand for more units even when total population is static.
Town of Kincardine	• Housing starts were steady at a moderate rate. • Residential units were exclusively single family. • A small number of seasonal dwellings were constructed.	• Housing starts increased rapidly after 1969. • Multi-family units were constructed. • Conversion of larger homes to apartments. • Demand exceeds supply.	• Demand for accommodation between 800 and 1,000 households to 1978. • A trend towards rental accommodation. • A fall in demand after 1978.	• From 85% to 95% of the new demand is directly or indirectly related to B.N.P.D.
Town of Port Elgin	• Housing starts were steady at a moderate level of 20 per year in the early 1960's.	• Housing starts increased rapidly after 1969. • Cottage construction decreased to zero. • Construction commenced on multiple family units. • Demand exceeds supply.	• Demand for accommodation for between 1,000 to 1,200 additional households to 1978. • Increased demand for temporary and rental accommodation. • A fall in demand after 1978.	• From 85% to 95% of the demand at the peak can be related to B.N.P.D.
Town of Southampton	• Information on housing starts not available prior to 1971. • Population figures indicate steady growth. • Servicing constraints have been a limiting factor.	• Housing starts have increased since 1971. • Construction commenced on multiple family units. • Demand exceeds supply.	• Demand for 200 to 500 additional households to 1977. • Increase in demand for temporary and rental accommodation. • A fall in demand after 1978.	• From 80% to 90% of the demand at the construction peak can be related to B.N.P.D.
Town of Walkerton	• Housing starts had been at steady rate of 10 to 15 units through the 1960's. • Demand for housing consistently high. • Types of housing include single family, semi-detached, duplexes, townhouses, and low rise apartments.	• Only a small increase in the number of housing starts or in pattern of construction for multiple family dwellings.	• A small acceleration in the demand for accommodation for between 100 and 250 new households to 1978. • Only a small decline in demand after 1978 as other growth factors stimulate growth.	• Approximately 50% of demand at the peak can be related to B.N.P.D.
Village of Paisley	• Information on housing starts not available before 1969. • Population figures indicate slow growth. • Primary housing type single family.	• Since 1969 housing starts have increased year by year. • New housing starts have been single family dwellings, mobile homes or apartments.	• Additional accommodation for between 50 and 150 households will be required to 1978. • Further growth is dependent to a large degree on the provision of sewage treatment.	• From 80% to 90% of the demand for new housing to 1978 is related to B.N.P.D.

Table 4.3 Housing Impact (continued)

	Situation before establishment of B.N.P.D.	Changes since the establishment of B.N.P.D.	Projections on the basis of B.N.P.D.'s future plans	The extent to which changes can be attributable to B.N.P.D.
Village of Ripley	• Information on dwelling starts not available in detail but municipal representatives indicate the situation was static with an occasional new single family home being built.	• Housing construction in recent years has been in the form of infilling and the conversion of larger homes to apartments.	• To 1978 a demand for accommodation for between 50 and 150 households is anticipated with a decline after 1978. • An increase in demand for temporary accommodation is anticipated.	• From 80% to 90% of the demand both in the short and long term can be related to B.N.P.D.
Village of Tiverton	• Information on dwelling starts are not available prior to 1969 but municipal representatives indicate the situation as static with the occasional single family home being built.	• Housing construction since 1969 has increased steadily. • The value of residential building permits increasing 600% between 1970 and 1973.	• Closeness to site makes demand at this centre unlimited the only constraints being physical, financial and administrative. • It is projected that accommodation for up to 250 households could be provided to 1978. • Demand after 1978 could drop more gradually than for other centres after 1978.	• From 90% to 95% of both the long and short term can be related to B.N.P.D.
Township of Bruce	• Building starts for single family homes steady and slow through the 1960's.	• Since 1969 construction of single family homes has been slow but increasing while cottage construction has proceeded at a faster rate. • New population growth has been primarily in a few mobile home parks consisting of approximately 120 units in total. • The conversion of cottages has proceeded steadily.	• The primary demand is expected to be for mobile homes. Cottage conversions are expected to slow as a result of new Official Plan policies. • Demand for accommodation for between 100 and 200 households is anticipated to 1978 with a drop to 20 or 30 by 1984 in the long term.	• From 80% to 90% of the demand for permanent housing can be related to B.N.P.D.
Township of Huron	• Detailed information not available prior to 1967. Municipal representatives indicate the construction of a few single family homes and a substantial number of cottages.	• Single family construction has continued to be slow but cottage construction has accelerated. • The conversion of cottages appears to have also increased.	• Demand to 1978 for accommodation for between 50 and 100 dwellings with a drop after 1978. • The primary form of accommodation is expected to be cottage conversions unless policies are formulated to prevent this. • If services are extended from the Town of Kincardine this estimate will prove conservative.	• From 80% to 90% of the demand for permanent housing can be related to B.N.P.D.
Township of Kincardine	• Detailed information on housing starts is not available prior to 1967. • The construction of single family homes appears to have occurred at a slow rate with a substantial number of cottages being constructed.	• The construction of single family homes accelerated dramatically in the late 1960's and early 1970's while cottage construction continued at a similar rate to the past. • Cottage conversions increased	• Demand to accommodate between 300 and 400 households to 1978 with a decline after this date. • Much of the demand is for temporary accommodation and will likely be met by mobile homes and cottage conversions.	• From 80% to 90% of the demand for permanent homes can be related to B.N.P.D.
Township of Saugeen	• Detailed information on housing starts is not available prior to 1967. • The construction of single family homes appears to have occurred at a slow rate with a substantial number of cottages being constructed.	• The construction of single family homes and cottages has increased steadily since 1969. • Mobile homes and cottage conversions have accommodated a number of permanent residents.	• Demand to accommodate between 100 and 200 households to 1978 with a decline after this date. • Much of the demand will be for temporary accommodation.	• From 85% to 95% of the demand for permanent homes can be related to B.N.P.D.

Figure 4.1 Bruce Nuclear Power Development: Manpower Actual and Forecast



Source: Ontario Hydro

CHAPTER FIVE

Land-Use Impacts of Electric Power Planning in Ontario

Agriculture in Ontario

Since 1951, the structure of Ontario agriculture changed dramatically. The total population of the province almost doubled, from 4.5 million to 8.3 million, while the population on census farms fell from 702,000 to 241,000.[1] The percentage of Ontario residents living on farms fell from 15.3 to 4.1. The number of Ontario farms fell from 150,000 to 88,000. The average Ontario farm in 1951 had $17,000 in invested capital; by 1976, average invested capital per farm stood at $209,000.

From 1971 to 1976, the total number of farms fell from 95,000 to 88,000, while total farmland area fell from 15.9 to 15.5 million acres (6.3 million hectares). (An acre equals approximately 0.405 ha.) "Improved" land – land that is in active use for crops – increased from 10,864,000 acres to 11,069,000 (4.5 million hectares), and total capital investment increased from $6.9 billion to nearly $17 billion. Much of this increase in capital value was a result of rising land prices.

Part of the increase in the capital value of land has come about because of the growing shortage of food products at the world level. Sharply higher prices for all farm products followed the world food shortages of 1973 and 1974. The farm value per acre of field crops grown in Ontario was only $47 in the 1950s, and $76 in the period 1966-70, but it averaged $129 between 1971 and 1975 and rose to $163 in 1977. Higher prices have provided the capital necessary to bring land back into production and to undertake farm drainage to make pasture and haylands suitable for the production of higher-value crops such as corn, soybeans, and white beans. The rate of decline in numbers of young farmers was slowed, as opportunities on the farm improved and slower employment growth off the farm reduced the incentive to leave. Larger equipment required larger holdings to take advantage of economies of scale. The result was intense competition among farmers for available parcels of foodland, driving prices higher.

At the same time, the prospect of continuing high levels of inflation has encouraged urban Canadians to invest in land as a hedge against inflationary losses in value of other assets. Land has, since 1970, been a better investment to Canadians and Americans, compared with stocks, bonds, or other collectable items, appreciating at nearly 13 per cent per year, compounded.

Finally, urban growth during the period has continued at a rapid pace, reflecting the high level of net migration into Canada from abroad and the maturing of the "baby boom" generation born after World War 2. Housing values have increased sharply, thus encouraging the purchase of larger homes as an inflation hedge. The desire for a "place in the country" has intensified and, coupled with policies favouring 10-acre lots for single-family homes and the imposition of expensive, full-servicing requirements for subdivisions, has encouraged tens of thousands of Ontarians to build homes on large lots within commuting distance of the larger urban centres.

Favourable tax treatment of farms at the municipal, provincial, and federal levels provided a further incentive for urban acquisition of farmland. The availability of farm credit in relatively large amounts and the escalation of loan limits contributed a further and as yet unquantified amount to the rapid rise in farmland prices.

Despite rising prices for farm products, the rapid increase in capital requirements for an Ontario farm, largely resulting from high land prices, means that the rate of return on investment in Ontario agriculture is still very low. For most Ontario farmers, off-farm income is essential to maintain a decent standard of living. In areas such as Bruce County, where little off-farm employment is normally available, projects such as the construction of the Bruce nuclear complex appear to have provided nearly three-quarters of the taxable income of tax-paying local farmers in recent years. Such projects therefore have an important impact on farmland prices in the area and on the long-term incomes of farmers, and their completion may have unpredictable impacts on standards of living.

The number of farmers will likely continue to fall as productivity per man-hour increases. Farm labour remains hard to find and expensive; the available equipment is designed for larger farm units than are found in Ontario, and increasing mechanization therefore favours larger and larger units. Only 44,000 Ontario farms produced more than $10,000 in sales in 1976; of these, about 8,000 had sales of more than

$75,000. The latter are probably the only farms in Ontario that return a full-time living to their owners.[2]

Ontario agriculture produces about 30 per cent of Canada's domestic food output,[3] including 30 per cent of dairy cattle and 36 per cent of swine. Ontario leads all provinces in the sale of poultry, meats, eggs, soybeans, corn, tobacco, fruits, and vegetables and is second only to Alberta in cattle and sheep sales, to Quebec in the sale of dairy products, and to New Brunswick in potato production. Total production of feed grains increased by 126 per cent between 1945 and 1975. Cattle and sheep numbers rose from 2.1 million in 1951 to 2.4 million in 1971, while grain-consuming animal units increased from 390,000 to over 622,000.

This output is generated by a total of only 16.8 million acres (7 million hectares) of good farmland, of which 11 million acres (4.5 million hectares) are "improved".[4] Ontario has just over 10 per cent of Canada's improved land, out of a total of 102 million acres (41.3 million hectares), and 16 per cent of Canada's cropland. But Ontario has half of Canada's 10 million acres (4 million hectares) of Class 1 cropland, nearly all of it in the southwestern Ontario portion of the Montreal-Chicago corridor, where population concentrations continue to increase. If Canada's population continues to expand at a rate of about 1 per cent annually, it will reach about 30,000,000 by the year 2000. The Ontario Institute of Agrologists has calculated, on the basis of about 1.0 acres per person and with a diet similar to present diets, that 30,000,000 acres of the best Class 1, 2, and 3 foodland will be needed to feed Canadians by the year 2000. Since Canada has over 100 million acres of improved land, of which only 69 million acres are currently cropped, it would appear on the surface that there will be plenty of land for the future expansion of population and for the maintenance of a comfortable export income from food.

Canada Land Inventory Classifications

Class 1 land – 100%*
Class 2 land – 80%*
Class 3 land – 64%*
Class 4 land – 50%*
*Potential production, with good management.

At the continental level, Canada and the U.S. have about 450 million acres of foodland. It has been estimated that by the year 2000, losses of land to urban uses will have resulted in all available and useful unimproved land being brought into production. Assuming that the U.S. population increases to about 245 million by the year 2000, the combined total of under 300 million can be comfortably fed at current levels of output. This assumes constant climate, technology, and yields per acre, and no drastic changes in birth rates or population displacement during the period. At some point past the year 2000, the exportable surplus of food would vanish and if yields per acre cannot be increased, a food deficit would occur.

There is substantial disagreement about whether yields per acre and total output can be increased. On the optimistic side are most agricultural researchers, who believe that improved varieties and better management, including the further control of pests and better use of natural fertilizers and improved drainage, can provide substantial increases in yield per acre or hectare. The Science Council of Canada argued, in 1976, that production of Canada's farmland could be doubled if farmers were provided with proper incentives. Even at the global level, Roger Revelle, a distinguished international economist, has said:

> If the productivity of the world's presently cultivated 3.3 billion acres (1.3 billion hectares) could be raised to equal that of the United States, the six to seven billion people anticipated in the year 2000 could obtain pleasantly adequate diets in terms of calories, proteins and other nutrients, even though their supply of animal products would be only half that of the average U.S. citizen today. Such an increase in productivity would not be inhibited by climatic or soil conditions in the poor countries. With full irrigation development, it would be possible to grow three crops a year over much of their cultivated land areas, while in the United States cold winter weather severely limits multiple cropping. The problem of increasing farm productivity in the poor countries is essentially one of creating radical changes in agricultural technology. This involves much more than agricultural science as it is usually defined, but such science is an essential component.[5]

On the pessimistic side are many Ontario farmers, who feel that a variety of influences may prevent further rapid expansion of output per acre. They note the effect of air pollution on white beans, soybeans, and tobacco in the counties of Kent, Essex, Elgin, and Norfolk; signs of deterioration of soils as the result of continuous cropping with corn and cash crops; the development of new and resistant

pests and weed varieties and the increasing dependence of agriculture on heavier applications of fertilizer and pesticides and larger inputs of energy. Others believe that Canada's global responsibilities include the feeding of a stable proportion of the world's population. Canada has 0.6 per cent of the world's population and 3 per cent of the world's cultivable land. If Canada is to continue to feed 0.6 per cent of the world's population, either through exports or by population shifts, it must feed 72 million people by 2020 A.D. and over 115 million by 2040, at current rates of world population growth. To feed 3 per cent of a world of 12 billion people, or 360 million, is obviously far beyond any possibility.

As Norman Pearson has pointed out:

> The basic implication that food must be shared in relation to acreage ignores the reality of the different carrying capacities of lands in warmer climates and the plain fact that if the food-deficit countries do not carry out the necessary changes to bring their population increases under control, and change their social and technical systems, all the best efforts will be in vain in another generation. Consider that while food production must be trebled by 2000 A.D., 25 per cent of food in the underdeveloped countries is lost in various forms of spoilage, or enough to feed about 20 per cent of global population (or 20 Canada's). Indeed, the world's future appears to be one in which food is the main political instrument, regardless of moral implications or charitable desires.[6]

Another factor that has implications for Canadian agriculture is the possibility of climatic change. Meteorologists have concluded that North American agriculture has achieved its very substantial gains in output per acre during an unusually favourable climatic period. There are signs that the climate may be cooling down and that a period of cooler weather could reduce Canadian cropland acreage, especially in the north. Between 1945 and 1968, there was a drop of 0.5°F (0.3°C) in average temperatures in the Northern Hemisphere.[7] Experts believe that a further reduction is possible over the next 50 to 80 years. A drop of 1°F (0.5°C) would move the operative agricultural frontier in Canada about 180 km to the south and would narrow the range of crop varieties in all parts of the country. It would also have serious impact on production in the U.S.S.R., the U.S., China, and probably the monsoon countries of the world (India, Pakistan, Bangladesh, Indochina, Indonesia).

Other disturbing factors that contributed to the sudden food shortages of the last decade and that could recur in the future include:

1. The world fish catch trebled between 1950 and 1970, but now appears to be declining as a result of severe overfishing in some of the world's most productive fishing grounds.
2. Asia has developed an import requirement of nearly 50 million tonnes of grain each year, even at present population levels. There appears to be little chance of self-sufficiency in the next 20 years.
3. Latin America, the U.S.S.R., and eastern Europe, once exporters, have become consistent importers.
4. Land, water, energy, and fertilizer, in abundant supply and low in price, were the keys to earlier increases in output per acre. All have become scarce and expensive.
5. Siltation, overgrazing, deforestation, and the creation of deserts are becoming more serious problems in many of the world's most heavily populated countries.

It appears obvious that Canada must safeguard the agricultural industry in a variety of ways. The agricultural industry, consisting of farmers and their families, farm labourers, and suppliers to farmers (including Ontario Hydro, feed, seed, fertilizer, and chemical manufacturers, and food processors and retailers) must be provided with incentives to continue to produce at higher levels of efficiency. Provision must be made for the preservation of foodlands, for more effective central services and capital, and for the development of policies that help the food industry to take long-term implications into account. While broad planning legislation may appear attractive in such a circumstance, it is obvious from experience in eastern Europe and the U.S.S.R. that state planning does not increase agricultural productivity. The greatest agricultural performance in the world has been delivered by North America's food industry, following a free-enterprise model.

Lester Brown, in a lecture at the University of Toronto in 1975, described the problem as:

> . . . a situation for which there is no historical precedent. In a world of food scarcity, while there may not be enough food to go around, North America must decide who gets how much food and on what terms . . . on the domestic side, perhaps the first requirement of a North American food policy is that it provide adequate incentives for farmers. If farmers are to expand production and make the needed investment decisions, both immediate and long-term, they must be assured a fair return and a relatively stable world economy. As part of its contribution to a global food strategy, North America should keep all its cropland in production, at least until stocks are rebuilt to a safe level.[8]

The Foodlands of Ontario

Ontario is Canada's most favoured province in the extent, quality, and range of its foodland. Of Canada's foodlands, Ontario has 11.6 per cent of the Canadian total.[9] However, only about 15 million acres of Ontario's potential foodland is currently in use, and of this amount only 11 million acres is improved land, situated largely in southern Ontario and enjoying a favourable climate (see Figure 5.1). About half of the improved land is either underdrained, or should be drained for it to achieve full productivity. It is estimated that, with such improvements as drainage, the 11 million acres, together with the most favoured of the remaining Ontario foodlands, could increase productivity by from 50 to 100 per cent.[10]

Fig. 5.1: p. 82

Table 5.1 Use of Farm Land in Ontario, 1921 to 1976, and in Canada, 1976

Use (hectares)	1921	1931	1941	1951	1961	1971	1976	1976 (Canada)
Improved land	5,267,744	5,309,194	5,345,344	5,077,300	4,813,170	4,345,840	4,283,120	32,828,971
Under crops[a]	3,752,407	3,836,294	3,704,650	3,458,121	3,196,143	3,142,356	3,375,277	21,133,664
Pasture	1,216,619	1,177,427	1,295,146	1,294,138	1,318,244	934,578	702,011	3,127,253
Summer fallow	210,472[b]	137,854	128,306	133,506	97,937	95,166	68,524	7,780,612
Other improved land	88,246	157,620	217,242	191,536	200,846	173,740	137,308	787,442
Unimproved land	3,783,817	3,827,165	3,609,848	3,274,722	2,618,233	2,039,382	1,614,610	22,969,358
Woodland	1,805,867	1,880,984	1,545,948	1,541,110	1,303,036	920,248	752,173	5,497,981
Other unimproved land	1,977,950	1,946,181	2,063,900	1,733,612	1,315,198	1,119,134	862,437	17,471,377

Notes:
a) Includes field, vegetable, fruit, and nursery crop land.
b) Includes idle land.
Sources:
Statistics Canada, 1971 Census, Cat. No. 96-707, June 1973, Table 2.
Statistics Canada, 1971 Census, Cat. No. 96-701, Table 30.
Statistics Canada, 1976 Census, Cat. No. 96-854, May 1977, Table 12.

Table 5.2 Land Capability for Agriculture

	Canada (excluding B.C.) (thousands)		Ontario (thousands)	
Class	Acres	Hectares	Acres	Hectares
1	10,809.0	4,323.6	5,552.3	2,220.9
2	41,887.0	16,754.8	5,825.9	2,330.4
3	64,902.0	25,960.8	8,095.9	3,238.4
4	61,815.0	24,726.0	7,165.7	2,866.3
5	67,617.0	27,046.8	4,715.2	1,886.1
6	34,888.0	13,955.2	2,944.0	1,177.6
Organic	50,155.0	20,062.0	5,310.2	2,124.1
Total	332,072.0	132,828.8	39,609.2	15,843.8

Source: Soil Research Institute of Agriculture Canada, and C.L.I., Lands Directorate, Environment Canada.

To accomplish this improvement in productivity will require that capital investment for farm drainage be doubled from present levels of $30 million per year. Main drains must be built by larger municipalities or the province to allow for the installation of smaller farm drains, at a further annual investment by local municipalities and farmers of at least $30 million. These investments will make possible the conversion of high-quality lands now producing pasture and hay to the production of higher value crops. All of this must be done, however, with the knowledge that farm management improvements will be needed to preserve the quality of the soils under conditions of more intensive use. The improper or excessive application of fertilizers and pesticides, and the introduction of continuous monocultural cropping without rotation, could damage the province's lands unless they are accompanied by increased investments in research and farm-management training.

Classes 1, 2, and 3 soils, together with some unclassified peat soils of the type found in the Holland and Thedford marshes, are the "foodlands" of Ontario. They are suitable for sustained production of up to 100 field crops, depending on local climatic limitations and on the quality of management available. Class 4 is marginal for sustained agriculture, Class 5 is capable of producing only hay and permanent pasture, and Class 6 is suitable only for pasture. Class 7 soils are now considered to be unsuitable for

Table 5.3 Performance Indices for Soil Classes (Canada Land Inventory Classification)

Class	Arable crop yields (Hoffman)	Forage yields (Anderson)
1	1.00	1.00
2	0.80	0.80
3	0.64	0.66
4	0.49	0.58
5	no values	0.53
6	no values	0.44
7	no values	no values

Source: D.W. Hoffman, "Notes on Agriculture", Vol. X, No. 2, 1974.

agriculture, although they were once incorporated into farms and may include small pockets of potentially usable lands. The top three soil classes are, or course, not only suitable for foodland, but can be used for forestry, recreation, wildlife, and urban development. They are therefore the lands of choice for all purposes. In the absence of guidelines, they will move into the use that can pay the highest price in the short run.

Certain limitations to the classification are important. Not only are organic or peat soils not included, but sandy and droughty lands are included in the lower classes, even though, in Ontario, British Columbia, and Prince Edward Island, they may be suitable for production of tobacco and, with fertilization and management, for a variety of fruit and vegetable crops. The classification is being improved constantly to take such limitations into account.

The reassuringly large areas of land also conceal a variety of limitations imposed by climate and competing uses. As Hoffman and Noble have stated:

> Large areas have been set aside for urban expansion and parks and are no longer available for agricultural pursuits although a certain amount of agriculture may be taking place within town and park boundaries. Land is being converted from agriculture to other uses so quickly that keeping an accurate figure of the land is an almost impossible task.[11]

Climatic Limitations on Ontario Foodland

The most significant limitation on the productivity of Canada's foodlands is climate. Southwestern Ontario not only possesses the largest single block of Class 1 and 2 land in Canada, but also enjoys the longest growing season (between 130 and 153 days), the most dependable growing-season moisture supply, and the most intense and sustained supply of growing-season sunshine. The result is that, while much of the prairie region is restricted to fewer than a dozen crop alternatives because of dryness and temperature, and while the Atlantic region is restricted by excessive moisture, lack of sunshine, and a scarcity of large parcels of continuous cropland, Ontario is Canada's most adaptable agricultural province. This accounts for the rising production levels of Ontario foodland, and it indicates a future ability to shift from one crop variety to another and from existing production and management systems to new and improved ones, as domestic and world markets require.

This flexibility in the mix of agricultural crops in response to the market and the ability to move from traditional to modern management, together with rapid urban encroachment on foodland, has brought about some dramatic shifts in the distribution of types of farms during the past three decades. Pearson describes the main trends as follows:

1. The loss of the former Lake Ontario fruit and vegetable belt to the urban area around Toronto.
2. A reduction in Niagara fruit belt acreage from 38,000 acres in 1940 to 23,500 in 1975.
3. The reduction of the Georgian Bay fruit-growing area.
4. Conversion of the fruit and canning-crop belt north of Lake Ontario to horticultural specialties and urban uses.
5. Emergence of new specialized-crop areas, such as the Alliston potato and tobacco belt, as farmers migrated to areas farther from the city.
6. Development of marshlands for vegetable production (Holland, Thedford, Erieau, Pelee) and the movement of early vegetable canning crops to Essex County.
7. Expansion of corn acreage to the north and west, as a result of new and shorter-season varieties. This not only provided the basis for conversion of pasture and haylands to grain-corn production, but also expanded production of silage corn and provided the basis for expansion of Ontario's beef-finishing industry.

8. Sharply higher production efficiency in intensive poultry and livestock production near urban markets.
9. A sharp decline in production on poorer lands (close to the Canadian Shield and in northern Ontario) which are less adaptable to new and larger equipment and less profitable for more skilled managers.[12]

These shifts underline the necessity to take climatic limitations and soil productivity into account in agricultural planning. As farmers become more mobile, more conscious of the advantages of better soils, warmer climates, and proximity to urban markets, and capable of managing a flexible production plan taking current markets into account, they move out of marginal areas and intensify pressure on the most-favoured foodlands. The result is that the "reserve lands" of the clay belt become less attractive, even with the high land costs in southern Ontario. The clay belts (with Class 4 soils, taking into account poor drainage and a cool climate) will produce about half the yield per acre, after drainage, of Class 1 soils in the south; but the drainage costs will be high and distance from markets adds a further disincentive to their use. If farm product prices were to fall, the operator would have little management flexibility, since short cropping seasons and long periods of winter feeding of livestock combine with lower crop yields to increase costs for all types of northern agriculture.

Air Pollution Effects on Crops in Southwestern Ontario

One of the factors that should be taken into account in assessing the future productivity of Ontario foodland is the impact on crop yields of various air pollutants. Farmers in Essex and Kent counties have been phasing out production of white beans in favour of crops less susceptible to air pollution; its damaging effects have also been noted in the Norfolk County area. The most susceptible crops appear to be white beans, tobacco, and tomatoes.

Air pollution across Ontario is steadily increasing as a result of industrialization in Canada and in the north-central United States. Air movements from a southwesterly direction bring a variety of pollutants that may be kept close to the earth by temperature inversions, caused when warm air from the south, laden with pollutants, is held down by colder air masses moving down from the northwest. Since these conditions characterize the Canadian climate for periods of several days at a time, and may occur several times during a single growing season, the potential for damage to crops is great.

As Ormrod[13] and others have pointed out, there can be air pollution effects on crops near built-up urban areas, as a result of motor vehicles, home-heating facilities, and industrial installations. The most damaging effects, according to Ormrod, result from the effect of sunlight on the components of exhaust gases from internal combustion engines. Hydrocarbons and nitrogen oxides react in light to form ozone and other oxidizing agents which may combine with small amounts of organic substances produced by plants to produce a reaction that will inhibit plant growth or cause blemishes in fruit.

The constituents of oxidant smog can travel great distances with air masses, and all of southern Ontario is occasionally blanketed in oxidant smog, which can damage sensitive crops. The development of supplementary sources of these constituents in southwestern Ontario could increase the concentrations substantially in places. Ormrod comments: "Development of an urban and industrial area associated with a power plant on the shoreline of Huron County would probably affect the concentration of oxidant smog in the County."[14]

Ormrod cites studies to show that yields of tomatoes, corn, and soybeans can be reduced by as much as 45 per cent by oxidant levels found near urban areas.

Sulphur dioxide pollution is likely to occur only in the general area of industrial sources of sulphur dioxide and would be less likely to cause problems, since plants can metabolize part of the pollution to meet part of their normal sulphur requirement. As a result, plant species vary widely in SO_2 sensitivity. However, high stacks which distribute SO_2 over a wide area provide the threat of "acid rain", a weak concentration of SO_2 in water, which can cause damage.

Fluorine is found in coal and may cause deterioration in the bones and teeth of livestock and have some damaging effects on crops.

Ormrod, Hofstra, and Humphreys, of the University of Guelph, conducted a systematic study of oxidant smog (ozone) across western Ontario during the summer of 1976, to determine the characteristics of ozone episodes in relation to weather factors, and to determine to what extent Huron County was affected.

Ozone episodes with concentrations that exceeded eight parts per hundred million, and were therefore potentially injurious to crops, occurred at Kippen on 18 days in the 10-week period from June 18-August 31.

Generally, when levels were high in one location in southern Ontario, they were also relatively high at other locations. In general, ozone was borne from west to east, reaching peaks in Michigan a day earlier than at Kippen, and peaking in New York State a day later. In general, air-pollution peaks occurred when high-pressure areas were centred over Quebec, drawing warm southwesterly flows of air up from the Midwest over southwestern Ontario. With the passage of the weather front, ozone levels dropped sharply.

In Huron County, injury to tobacco plants was observed following the high ozone levels in June. Beans were bronzed across Huron County following pollution on August 20-22.

In general, ozone reaches its peak downwind from large urban centres. Chicago, Detroit, Toledo, and Cleveland all contribute to the ozone episodes charted by Ormrod. It is obvious that the development of large industrial centres in southwestern Ontario would contribute to concentrations of air pollution over foodland areas.

> Kent County at one time produced close to 40 per cent of the white bean crop in Ontario and now produces about 5 per cent.... Significant in that production shift was the fact that yields were reduced as a direct and measurable consequence of air pollution in that green and lovely rural county.[15]

In Ontario, losses from this cause are estimated at $25 million over the last 20 years for tobacco and $3 to $4 million over the last five years for white beans.[16]

The most important area requiring new and continuous air-pollution research is the development of air-quality criteria and standards with respect to vegetation. Standards are needed to prevent agricultural and forestry losses, to maintain cover crops against erosion, and to preserve the aesthetic appeal of ornamental trees and the landscape. Research is needed on time-concentration (dosage) experiments, the interaction of pollutants, the effects of toxic concentrations of elements, the interaction between air pollutants and water nutrients, pathogens, herbicides, and pesticides, and the formation of photochemical oxidants in non-urban areas.[17]

Ranking Ontario's Foodlands

As a result of the concerns about disappearing foodland and the role of Ontario Hydro as a user of land, a Working Group on Agricultural Methodology was set up in 1975. It included planners from Ontario Hydro and representatives of the Ministry of Agriculture and Food, the Ontario Institute of Agrologists, and the Ontario Soil and Crop Improvement Association. The group set out to develop a methodology for incorporating the "agricultural production factor" into Ontario Hydro's long-range planning studies for southern Ontario, to fulfil the requirements of the Environmental Assessment Act.

In response to the Environmental Assessment Act, Ontario Hydro is developing a planning framework that will allow for the identification and evaluation of the effects of specific plans as well as their alternatives on any aspect of the environment. Hydro will then try to avoid areas of greatest concern, such as foodland or environmentally sensitive areas. "Concerns" include human settlements, wildlife, timber production, agricultural production, mineral extraction, terrestrial communities, aquatic communities, recreation areas, and the appearance of the landscape.

To involve the public in the planning process, Ontario Hydro held a series of seminars and workshops in mid 1975 with representatives of interest groups and government ministries to discuss the planning problem and to solicit reactions. Out of these sessions arose a number of task groups that have since worked with Hydro in developing specific aspects of the methodology that pertain to their areas of interest. One of these groups was the Working Group on Agricultural Methodology.[18]

The Working Group decided to develop a province-wide data base on foodlands, assess the impact of transmission facilities and generating stations on various foodlands, and develop weightings to establish the importance of impacts on agriculture as compared with impacts on other parts of the environment.

The group developed a computer-assisted technique for assembling available information on foodlands and manipulating the information to obtain a reasonably accurate and usable perspective. The first goal was to identify present and potential future levels of agricultural productivity and to describe the

general patterns of current rural land use. The ultimate goal was to develop a single "foodland map to classify the rural landscape into various categories based on their relative importance for current and future food production when viewed in a provincial perspective".

Foodland was defined by the group as Class 1, 2, and 3 land in areas with more than 2,300 corn heat units, soils capable of producing specialty food crops, land producing food in areas with special market conditions (i.e., isolated areas), and Class 1, 2, 3, 4, and 5 land in areas with less than 2,300 corn heat units.

Corn heat units are based on the relationship between temperature and corn development. They provide a useful indicator of climatic boundaries. Areas with more than 2,300 corn heat units can produce a range of up to 100 crops, including corn, soybeans, and white beans. Areas with less than 2,300 corn heat units can produce only a much narrower range of crops regardless of whether the soil is Class 1, 2, or 3.

Five variables that can affect the above categories were defined: potential soil productivity, climatic limitations on crop production, present productivity (i.e., amount of land used for crop production and present crop yields per acre), special markets, and the existence of strong rural communities.

The Canada Land Inventory classification, despite its limitations, was used as the basic source of information about land types and was modified, to take into account climatic limitations (soils with less than 2,300 corn heat units are downgraded by one class), and to recognize the fact that some Class 4 land is highly valuable as fruitland if the climate is favourable. On this basis, a map of potential soil productivity for common field crops was developed. The map shows that the amount of top-quality land for common field crops makes up only 21.5 per cent of the land area of southern Ontario. Even the addition of Class 3 soils only brings the total up to slightly less than 25 per cent.

Table 5.4 Percentage Occurrence of Potential Soil Productivity Classes

Soil productivity class	Percentage of study area
Class 1 equivalent (modified by Hoffman)	7.5
Class 2 equivalent	14.0
Class 3 equivalent	4.3
Class 4 equivalent	5.5
Class 5 and 6 equivalent	10.0
Organic soils	2.9
Class 7 equivalent and unclassified lands[a]	55.8
Total	100.0

Note a) Unclassifed land includes urban areas, armed forces bases, Algonquin Park, and lakes.
Source: "An Approach to Classifying and Ranking Ontario Foodlands." Report of the working group on agricultural methodology for Ontario's long-range planning system studies, December 1976, p. 180.

Climate

The Working Group on Agricultural Methodology gave extensive attention to climatic limitations on Ontario foodlands, particularly to areas that receive fewer than 2,300 corn heat units annually. It was decided to drop soils by one class in such areas, to reflect lower productivity. Thus, Class 1 becomes Class 2, Class 2 becomes Class 3, and so on. All calculations were made on this basis. Classes 4 to 7 were not changed, since they are unsuitable for field crops in any case.

This decision applied particularly to the Dundalk upland, where, despite the presence of Class 1 soils, a combination of poor drainage and fewer than 2,300 corn heat units makes the cultivation of field crops difficult.

Apart from the Dundalk upland, the group drew special attention to such areas as the Niagara Peninsula, the Kent-Essex area, and the southern shore of Georgian Bay, where a combination of factors makes fruit- and vegetable-growing possible and allows the cultivation of a much wider range of crops than elsewhere in the province. Figure 5.2 indicates clearly the effect of temperature on productivity. Areas with fewer than 2,300 corn heat units have little capability for the cultivation of corn, beans, and other high-value crops, regardless of soil classification. Fig. 5.2: p. 83

The group examined the potential effect of Ontario Hydro facilities on present levels of productivity and on the standard of living of farm operators. This required an overview of current farming activity

and crop productivity. Ministry of Agriculture and Food information on crop productivity by county was used for this purpose.

In general, it was found that Kent County had the highest crop-yield index, while index levels declined to the north and east. To obtain a measure of cropping intensity within the enumeration areas, it was decided to obtain a measure of acreage of each crop as a percentage of the enumeration area. Fruits and vegetables were excepted from this approach, since in the Niagara and Meaford areas, where specialty crops predominate, sizeable acreages of non-agricultural land uses occur in the same enumeration area (e.g., the Meaford military range). In these areas, the acreage of specified crops was calculated as a percentage of total farmland in the enumeration area.

In this way, maps were prepared to show percentages of land used for tree fruits and berries, vegetables, tobacco, all crops excluding hay and pasture, dry beans, and total common field crops excluding pasture. The area of pasture was left out of the calculation of the total common field crop acreage in the enumeration areas.

Adjustments were made for northern Ontario, where large areas of forest were included with the cultivated land within the enumeration area.

The result of the process was a map showing farming intensity in the province, ranging from the very intensive croplands of Essex and Kent with smaller patches in Middlesex, Oxford, and Waterloo, to the less intensively farmed areas to the north and east.

Special Markets

Class 2 and 3 soils in the clay belt are extremely valuable to the regional market, since imported food is expensive. However, it was concluded that even the best soils in northern Ontario do not compare favourably with most southern soils, due to climatic limitations. It was also concluded that "in areas where such conditions occur, the opportunities of avoiding agricultural land in locating new Ontario Hydro facilities are much greater than in southern Ontario".

The Rural Community

The Working Group on Agricultural Methodology recognized that "a viable and vigorous agricultural community, capable of providing labour and capital to combine with the land base in the area, is essential, and that a suitable climate must be created to provide both incentive and relative freedom from oppressive external forces".

An effort was therefore made to determine the "rurbanization" – the spread of non-farm uses – into the rural community.

Four categories of population density were established:

1. Urban: more than 119 inhabitants per square mile
2. Urban fringe: 50-118 inhabitants per square mile
3. Urban shadow: 26-49 inhabitants per square mile
4. Rural: fewer than 26 inhabitants per square mile

The results showed that about 20 per cent of the area south of the Laurentian Shield falls within the urban and urban-fringe zones and only about 45 per cent of this area is relatively free of the influence of non-agricultural residences.

Table 5.5 Population Distribution by Zone South of the Canadian Shield[a]

Population zones	Percentage of off-shield area
Urban	7.7
Urban fringe	11.8
Urban shadow	35.5
Rural	45.0
Total	100.0

Note a) Includes land area only – major lakes have been deleted.
Source: "An Approach to Classifying and Ranking Ontario Foodlands." Report of the working group on agricultural methodology for Ontario Hydro's long-range planning system studies, December 1976, p. 180.

The group concluded that, while it was generally agreed that rural areas exhibiting the highest population densities are likely to have suffered the greatest degree of community fragmentation, it was also

recognized that an insufficient body of knowledge exists to permit a defensible correlation between levels of population density in rural areas and degrees of viability of the farming community.

Synthesis of Data and Conclusions

The group then faced the task of defining and ranking areas of the province that should be given high priority for food production. The following principles were followed:

- Primary concern is for the retention of high-quality agricultural land for food production for present and future generations.
- The available land base must also be adequate to respond to external demands for the export of agricultural products to food deficient regions.
- The greatest opportunities for efficient increases in agricultural production in the future lie in areas of high-quality land where the necessary capital and management inputs are already in place.
- The relative degree of scarcity of certain types of land capable of producing a wide range of crops is an important consideration in determining their relative level of importance.
- The relative scarcity of land suitable for growing specialty crops is a very important determinant in the ranking.

A ranking of foodland categories was developed, taking into account soil productivity, climate, existing agricultural land-use, and existing and proposed non-agricultural land uses.

The ranking for foodland classes indicates those areas which, if utilized for non-agricultural purposes, would have the greatest direct impact on the province's food-production system.

Areas currently producing fruits and vegetables were given highest priority because of the limited amount of land in the province possessing the precise combination of soil and climatic characteristics needed to produce present varieties on a commercial scale. Areas with climatic advantages (over 2,300 corn heat units per year) came next in the priority ranking, followed by areas with lower cropping intensities or with fewer corn heat units, followed by tobacco lands and organic soils not currently in production, and then by lands officially designated for non-agricultural use.

The final result was a foodland classification map for the province, that is now being used for the development of "bands" through which Ontario Hydro can develop corridors with minimum impact on foodlands. This multi-coloured map may be seen on page 54 of the Working Group Report, at Ontario Hydro, or in the Food Lands Development Branch of the Ministry of Agriculture and Food. The map provides the most detailed land classification available for Ontario and takes into account all the relevant factors associated with productivity in agriculture. It shows clearly the extreme competition between urban interests and farmers for Ontario's best land.

It contains a number of interesting relationships:

- Of the 9.7 million acres of Class 1 and 2 land, about 18 per cent is under the influence of strong urban pressures.
- 48.5 per cent of fruit and vegetable areas lie within either urban or urban-fringe areas.
- Over half of the most valuable foodland is within "urban shadow" areas.

It is concluded that land capable of producing fruit and vegetables is both in short supply and under very strong pressure from "rurbanization". Prime lands for field crops also represent a small portion of the total study area. When the influence of "rurbanization" on the long-term viability of agricultural communities is also taken into account, the supply of good farmland acreage for the future appears to shrink substantially.[19]

Urban Encroachment on Ontario Foodland

The Planning Act Review Committee that was set up in 1975 by the Government of Ontario summarized the problem of encroachment on foodland in the strongest terms:

> The area of improved farmland in the Province has declined by 2.5 million acres in the past 30 years. Even more striking is the fact that almost half of this decline took place in the last five years of the period (1966-71). This means that an average of some 200,000 acres of improved farm land per year went out of production and the trend continues. At this rate, half of the present foodland in Southern Ontario would be out of production by 2025 A.D. The first thing to remember is that a part of this land (and much of this part highly productive Class 1 and 2 land) was lost to urbanization. It is being used

> for housing, airports, roads, industry, etc., and the likelihood of bringing any substantial part of this land back to production seems remote.[20]

It is obvious and perhaps inevitable that the rapid expansion of Ontario's population would place great pressure on lands close to the cities to provide essential housing, transport and energy corridors, and space for industrial growth. This natural process of expansion to provide essential services has taken place on the most-favoured shoreline lands, with deep soils for fruit and vegetable crops and, in the case of the Niagara fruitlands, with unique protection from the rigours of the climate. Dr. R. R. Kreuger, speaking to the Niagara Regional Council in 1976, stated:

> My investigations show that Niagara has the best natural environment for peaches and other tender fruits in all of Canada. It is better than all of the United States except California, where irrigation is required and where urbanization is also a major threat to fruit growing. Niagara has less chance of frost damage to peaches than Georgia, which is dubbed the "peach state of the United States". Unless drastic changes are made in the direction and pattern of urban growth, the tender fruit soils will completely disappear as an agricultural resource by the end of the century. We have reached the eleventh hour in decision making.[21]

It is expected that Ontario will grow by about 2 million people by the year 2000. If it is assumed that 15 persons can be housed per acre, and that about half of this population can be housed across the province on lands that are not ideal foodlands, urban encroachment will not be a serious problem. However, Norman Pearson has shown that Ontario cities have been housing only six or seven persons per acre in recent years and that, allowing for infrastructure expansion (roads, hydro lines, railways, industry, commerce, quarries, and pits), the additional 2 million might be able to use as much as 1.5 million acres of land. Estimates of this kind, prepared since 1975, have led to public realization that the period of land abundance in Ontario is over and that, in the future, the best foodlands must be preserved for agriculture.

It has been extremely difficult to obtain estimates of the amount of foodland of all types that has been lost to true urban encroachment. On the one hand, it has been argued that "26 acres of foodland per hour were lost to agriculture" in recent years. This estimate was made by taking the census definition of all lands producing $50 worth of produce in 1966 and comparing it with "farms" producing $50 of produce in 1971. This showed a total loss of 1,139,700 acres during the five-year period and produced the 26-acres-per-hour figure. However, it was obvious that many factors were at work during the period, and that much of the land that was abandoned was not permanently lost to rural use. As the document "Strategy for Ontario Farmland" noted: "Some of that land has come back into full-time production since 1971. An estimated 6.6 acres per hour of principal field crops have come back into production and much more of it can be returned to crop production when required."[22]

Acreage of improved farmland in southwestern Ontario fell only slightly during the period, but in marginal areas of low-quality land (e.g., Parry Sound and Manitoulin) land losses amounted to over 20 per cent of total lands in use as farmers retreated from lower-quality lands or sold them for urban recreational use.

During the period 1966-71 Canada saw the retirement of 1,179,000 acres in Quebec, 1,139,700 acres in Ontario, 141,000 acres in British Columbia, and 328,000 acres in the maritime provinces, and the addition of 2,498,000 acres on the Prairies. The net loss of farmland in Canada was therefore 289,700 acres. The Ontario figure included the loss of 320,000 acres in eastern Ontario, about 170,000 acres on the edges of the Laurentian Shield and in northern Ontario, about 140,000 acres in southwestern Ontario, about 130,000 acres in Bruce and Grey counties and on the Georgian Bay shore, and about 360,000 acres in the urban arc around Lake Ontario and in the commuter and rural residential zone around it. "The central problem is the loss of Class 1, 2, 3, and 4 farmland close to the cities. In these areas, 13.7 per cent of the land in farmland in 1966 was not in production in 1971."[23]

Even within the boundaries of Ontario cities, there was profligate use of land. Pearson developed a table to show the amount of foodland claimed by Canadian cities for each person added to the city population during the period:
Windsor: 0.190 acres
Cities of 100,000: 0.380 acres
London: 0.458 acres
Mississauga: 0.785 acres
Ottawa: 1.000 acres
Montreal: 1.000 acres
Quebec: 1.000 acres[24]

The 2 million additional residents who will live in Ontario by the year 2000 would use 20,000 acres per year at the Windsor rate or 100,000 acres per year at the Ottawa rate, between now and the year 2000. At the highest rate of land-use, 2 million acres of land would be used to house 2 million people.

While the expansion of existing cities and towns to accommodate the additional 2 million must be planned so as to minimize expansion onto foodlands in the urban arc, in the Niagara Peninsula, and in southwestern Ontario, the problem of expanding demand for rural residences, second homes, ski chalets, and other life-style amenities demanded by Canadians as their incomes rise may be a much more serious threat to agriculture. While the homes themselves may be confined to smaller lots or to areas of lower-quality agricultural land (often the best-suited for forest management, and skiing and other recreational activities), the expanding use of the countryside by urban residents directly interferes with agricultural efficiency. In 1974, about 46 per cent of housing lots created in Ontario were in non-urban areas. The 2 million who will be added to Ontario's population by the year 2000 will need at least 600,000 primary housing units (at 3.5 persons to the household and one home per family). Many will want two housing units, if rural residences, cottages, and chalets are taken into account. But, if 46 per cent of even the primary housing units are in non-urban areas, 275,000 lots will be created outside the major cities.

This expansion, coupled with the growing use of the countryside for hunting and other activities, implies much heavier year-round demands on rural roads, interference with farm vehicles that must move from farm to farm during all seasons of the year, the imposition of air-quality standards by urban people not accustomed to farm smells and practices, the gradual replacement of farmers on local councils by owners of rural residences with different objectives for the countryside, and the gradual development of urban-use-oriented policies for large tracts of what has been farmland. This is noticeable in all areas of southern Ontario, but particularly in the Niagara Escarpment and Parkway Belt areas, and in all the counties surrounding Toronto and the urban belt, in the Georgian Bay Region, and, increasingly, in eastern Ontario.

As urban standards are applied to rural areas, farm-management flexibility, which has been so essential in the upgrading of Ontario agriculture and for the production of more units of food per acre, will be substantially reduced. The replacement of outmoded buildings by new, more efficient, and much larger ones will be affected. The morale and effectiveness of local councils and planning boards will be affected as they are urbanized, as will the morale and effectiveness of local farmers, together with the desire of their sons to remain in farming. In a recent study of the Simcoe-Georgian region, it was found that half of all land in the south of the county is now owned by urban residents. Recent clashes between farmers affected by the Niagara Escarpment Authority, who claim to have been prevented from making adjustments essential to effective farm and community management, and the urban residents and planners now planning the future of the area, make it clear that the indirect effect of expanding urban control of rural Ontario may be at least as threatening to farmers as the loss of foodland itself.

This may account, in part, for what appears to be a reversal in the long-term increase in farm productivity in the late 1970s. "Overall, agricultural output has seriously declined in absolute (terms) in recent years. Evidence suggests that the total productivity level of Canadian agriculture, food production and food distribution has dropped well below competitive levels to the tune of 10-25 per cent. But productivity is not a priority in farm policies and programs in Canada."[25]

Land-Use Programmes and Controls in Ontario

In the late 1960s, steps were taken to identify the area in which Ontario's principal urban development would take place, taking into account international markets for industrial products, the existence of a complex road, rail, and water transportation system, the availability of a diversified labour force, and the preferences of Canadians and immigrants to Canada for an urban life-style. These calculations led to the identification of the Central Ontario Lakeshore Urban Complex dominated by Toronto and including lakeshore areas from Port Hope to Hamilton (COLUC). It formed the core of the Toronto-Centred Region (TCR) which encompassed an area from Kitchener on the west to Georgian Bay on the north and Belleville on the east. In 1976, a document was produced by the government of Ontario entitled "Ontario's Future Trends and Options". It predicted that the provincial population would grow between 1971 and 2001 from 7.7 to 11.6 million, with growth in urban population from 6.3 to 10.0 million.

While there was no specific provincial policy on the rate of population growth, growth was being encouraged in the less densely populated areas and in areas with less foodland, towards the north and east. By 1977, in response to the reports of the Planning Act Review Committee and the Robarts Commission and to signs of growing unease with the degree of central planning in Ontario, the government shifted to a greater emphasis on decentralized municipal planning to deal with intense land-use conflicts. At the same time, Food Land Guidelines were formulated for the use of municipalities.

The trends that were identified in "Ontario's Future Trends and Options" included:

- the accelerating losses of Class 1, 2, and 3 agricultural lands to urban housing and rural residences
- increasing conflicts between urbanites and the farming community
- rapid growth in environmental problems related to sewage, water supply, air quality, noise, and solid-waste disposal
- problems caused by conflicting demands between recreation-oriented urbanites and farmers
- shortages and rising prices for aggregates needed both for urban use and for upgrading the highway system
- other land-use issues associated with a growing population, including transportation, energy supplies, education, housing costs, industrial development, urban sprawl, and strip development on the edge of towns and cities

Within the Central Ontario Lakeshore Urban Complex and the Toronto-Centred Region, five main goals were identified:

1. To contain urban growth in a corridor or linear pattern along the lakeshore to permit efficient transportation and urban facilities planning.
2. To prevent urban sprawl by maintaining a pattern of separate urban communities in two tiers paralleling the lakeshore.
3. To stimulate growth east of Metro Toronto as a balance to that occurring to the west and to limit development in the Yonge Street corridor.
4. To decentralize some of the growth to the north and east.
5. To preserve the best agricultural land and the best recreational areas. Recreational priority areas are the Georgian Bay shoreline, the Kawartha Lakes, Lake Simcoe, and the Niagara Escarpment.[26]

Within the COLUC region, a population of nearly 8 million was predicted by the year 2000. It is obvious that, in what will be a densely populated urban region, it will be extremely difficult to maintain an agricultural industry. However, COLUC contains 11 per cent of Ontario's Class 1 and 2 foodland and 8 per cent, or 900,000 acres, of the province's improved farmland. The total land area of COLUC is about 2 million acres.

Between 1966 and 1971, in the COLUC region, an average of 26,800 acres of farmland went out of production annually. Much of this land has not been developed but remains idle and in the hands of speculators. Estimates in May 1970 indicated that urban areas would consume an additional 200,000 acres of Class 1 and 2 land and would jeopardize the agricultural use of another 100,000 acres. Lower-class lands would also be affected, since farm units would be difficult to sustain.[27]

Within the COLUC area, the number of lots created annually by severance "equals the lots created in registered subdivisions. These fragmented holdings put added pressures on servicing costs and the social fabric of rural municipalities. A myriad of incompatible land-uses is created by such fragmentation. Currently in COLUC, between 3,000 and 4,000 acres of rural land are severed into lots annually."[28]

The problems created for farmers within the region by non-compatible uses were identified:

- interfering with a farmer's planning and work schedule
- decreasing production because of land disturbances caused by soil compaction, poor seeding, lack of weed control, and trampling by machinery
- interfering with crop irrigation, spraying, seeding, harvesting, and location of future buildings, and impairment of drainage systems
- increases in housing, recreation activities, and requirements for services for additional population
- increases in farm taxes through demands for services
- increases in foodland values because of speculation
- urban incompatibility caused by noise, odours, and social differences.[29]

To meet urban demands for the preservation of large areas of Ontario that would be suitable for recreational use, the government had earlier appointed two commissions: the Niagara Escarpment Commission and the Parkway Belt Task Force. Both bodies were to study large areas and draw up master plans that would provide guidelines to municipalities having jurisdiction over the areas concerned. In both cases, the planning brought into sharp focus the conflicts between urban and rural demands for space in Ontario.

Ministries Responsible for Municipal Planning in Ontario

To place the regulation of foodlands in context, the following brief review of provincial responsibilities for land-use in rural areas is provided.

Several provincial ministries have policies and programmes that influence municipal planning and land-use. The Ontario Ministry of Housing assumes the major role for municipal planning under the Planning Act. This act empowers municipalities to prepare official plans; to pass by-laws restricting the use of land to certain purposes, such as the control of the building of structures and the establishment of conditions for development or redevelopment; and to grant consents through municipal committees of adjustment or land-division committees. The content of official plans and zoning by-laws is controlled by the province through ministerial policies and regulations, in the review-and-approval process for official plans, and through zoning by-laws, consent policies, and related regulations.

Other ministries that influence land use and municipal planning are Agriculture and Food, Environment, Natural Resources, and Transportation and Communications. Treasury and Economics is no longer involved with land-use policies, but only with the economic component of regional planning.

Treasury, Economics and Intergovernmental Affairs (TEIGA)

TEIGA continues to have jurisdiction over the Ontario Land Corporation (OLC) which was established under the OLC Act in 1974. The principal object of the Ontario Land Corporation is to hold land for later development by "persons in the private and government sectors for residential, community, industrial, governmental, and commercial development".[30]

The OLC holds about 70,782 acres of land in the areas of North Pickering, Townsend, South Cayuga, and Edwardsburgh. The province has invested over $311,000,000 in this "land bank" and currently pays $28 million per year in carrying charges.

The North Pickering site, northeast of Toronto, consists of over 20,000 acres. A population of over 75,000 is to be accommodated over the next 15 to 20 years as part of the long-term housing strategy for Toronto. It is hoped that the community will be self-sustaining after achieving a population of about 20,000 and that it will help channel economic growth into the area east of Metro. An important aspect of the North Pickering plan is the preservation of agricultural land. 10,400 acres on the west side of the site have been set aside for long-term agricultural use; and an 8,000-acre open-space system on the west and south periphery of the proposed community will act as a buffer between it and other communities and will provide for agricultural and recreational uses as well as transportation and utility corridors.

At Townsend, about 14,000 acres have been set aside to house up to 100,000 new residents, attracted by the Nanticoke industrial complex. The first neighbourhood of 5,000 persons is to be occupied shortly.

The South Cayuga site consists of 12,690 acres that were acquired as a land bank in 1974 for long-term residential and industrial development. The area is now leased to farmers and no decisions have been reached about its long-term use.

The Edwardsburgh site, consisting of 10,425 acres adjacent to the town of Prescott, was acquired in 1975, to provide a well-planned area for a long-term heavy industrial complex. Studies to date do not indicate great potential for industrial use, although Ontario Hydro appears interested in land banking in the general area for a future fossil-fuelled or nuclear power site.

Ministry of the Environment (MOE)

The MOE plays a growing role in land-use planning, especially outside the cities. Its responsibilities are administered under four acts, the Environmental Assessment Act, the Environmental Protection Act, the Ontario Water Resources Act, and the Pesticides Act.

Under the Environmental Protection Act, the MOE implements programmes related to air-pollution emissions and noise, waste management and disposal, and litter management and disposal.

The Ontario Water Resources Act is concerned with the supply of water and the treatment and disposal of sewage. The Act provides for the appointment of provincial officers to inspect, monitor, and survey both the natural environment and structures and operations that are sources of contaminants.

The Environmental Assessment Act is the first piece of provincial legislation in Canada to provide a comprehensive framework for undertaking the environmental impact assessment of both public and private projects.[31] It has broad powers over the future use of rural lands and the operations of farmers. The legislation is designed to move away from the traditional abatement, or "after the fact", strategy and to ensure a comprehensive and co-ordinated consideration of all environmental factors, with public dialogue, before major projects are approved.

Under the Environmental Assessment Act, "environment" is defined very broadly to include the natural and physical environment as well as human and animal life, social, economic, and cultural factors, and the interrelationships among these elements.

The Act requires that an environmental impact assessment be undertaken and approved before a project is started. The assessment must describe the existing environment, the project, and the potential impacts; then it must consider the technological alternatives for the project, including the option of not initiating the project at all.

The Planning Act Review Committee found major duplication between the powers of the Environmental Assessment Act and the Planning Act and expressed concern that municipalities and individuals would face an impossibly complex process for obtaining approvals. The committee said:

> A major municipal concern regarding the Environmental Assessment Act is the provision that major business and commercial enterprises, if designated by the regulations, will be required to obtain environmental assessment approval before they can proceed. There is deep concern with the prospect of development proposals having to undergo duplicate sets of hearing procedures, one by the OMB [Ontario Municipal Board] with respect to zoning or official plan designation under the Planning Act, the other by the Environmental Assessment Board with respect to assessment under the Environmental Assessment Act. The Environment Minister has stated that it is not expected that the two boards would be considering the same things, and also that zoning applications before the OMB would not be proceeded with until the environmental assessment had been carried out. There is also concern at the prospect of two different approvals being required, one by the Housing Minister (or OMB) [and] one by the Environment Minister (or the Environmental Assessment Board), though both approvals might ultimately end up with the Cabinet under either Act.[32]

The Comay report and the Bossons report (cited earlier) made a number of recommendations to streamline the process and to avoid duplication. It appears that these recommendations are currently under consideration and that changes in the application of the various overlapping pieces of legislation can be expected.

Ministry of Natural Resources (MNR)

The MNR's Division of Lands reviews development proposals of individuals, private businesses, other government agencies, and municipalities to ensure that such proposals are compatible with MNR objectives and programmes. These include the maintenance of the natural environment and the continuing productivity of natural resources. The MNR reviews subdivision severances and other specific development proposals and makes recommendations to the Ministry of Housing or to the regions involved.

The MNR is drawing up a Strategic Land Use Plan (SLUP) for the province, and it is expected that this plan will be unveiled in the near future.

Specific legislation that directly affects farmers and rural municipalities includes the Trees Act, which regulates the destruction of trees, and the Pits and Quarries Act, which regulates the removal of aggregates, and licenses all gravel pits in the province.

Ministry of Transportation and Communications (MTC)

The Land Use Group of the MTC reviews and comments on draft official plans throughout the province and reviews subdivision plans. The MTC conducts environmental assessments under the Environmental Assessment Act, as related to municipal projects, such as the widening of highways, freeway upgrading, new interchanges, new service centres, and water crossings of all kinds.

The Municipal Planning Office of the MTC plans all urban transportation systems and conducts road

needs studies, to evaluate alternative urban development plans and multi-mode transportation systems. A provincial policy on railway relocation has also been initiated and pilot studies are to be conducted in five Ontario cities.

Ministry of Northern Affairs (MNA)

The MNA was set up in 1977 to establish a stronger provincial government presence in northern Ontario. It will help to develop policies and programmes to meet the problems, needs, and opportunities of northern Ontario, facilitate citizen participation in policy and programme development, and attempt to improve citizen awareness of and access to government programmes and services.

The MNA took over the 25 Northern Affairs offices formerly directed by the Ministry of Natural Resources, assumed responsibility for community and regional priority projects and townsite developments in the north that were formerly the responsibility of TEIGA, and has assumed responsibility for building sewage plants and access roads in the north. It has also assumed control of the Northern Ontario Resources Transportation Programme, the Ontario Northland Transportation Commission, the telecommunications system in the north, and the Isolated Communities Assistance Programme. The Ministry is currently working with municipal advisory committees in northeastern and northwestern Ontario in the development of regional plans.

Ministry of Agriculture and Food (OMAF)

The Food Land Development Branch (FLDB) was formed in 1974 to ensure that agricultural concerns are considered in land-use decisions. The FLDB was set up to:

1. Assemble an inventory of foodlands in Ontario.
2. Develop a programme for interim management of foodlands to be used for eventual development by government or private developers.
3. Prepare programmes for the efficient use of all foodlands.
4. Work with other ministries and review proposals of theirs that will affect foodlands.
5. Provide a field staff to assist with local foodland planning programmes.
6. Analyse land-use planning legislation in other jurisdictions and assess alternatives for an Ontario foodland preservation programme.

Copies of reports and plans are submitted to the FLDB by the municipalities and Ontario Hydro. Liaison is maintained with all provincial ministries. The FLDB is working with the Ministry of Housing to assess the loss of prime foodland resulting from severances and subdivisions.

The FLDB has developed a Farm Lease Programme for government-owned land at North Pickering, together with lands owned by the Ontario Housing Corporation and the Ministry for Correctional Services. Contact has been made with the MTC, Housing, and the federal government to determine whether additional public lands can be brought under the programme and leased to farmers.

The FLDB has prepared guidelines for hydro transmission lines, highways, pipelines, and new town sites for use by other ministries and agencies. The policy of the OMAF is that new town sites and related infrastructure should be located on lands of low agricultural potential.

The FLDB now reviews proposals for the use of foodlands from Ontario Hydro and ministries and agencies of the Ontario government. In March 1976, the OMAF issued a policy statement entitled "A Strategy for Ontario Farmland". Two initiatives were outlined in this paper: the retention of the best foodlands for agricultural use, and the initiation of programmes to maintain the economic feasibility of keeping foodlands in active use on well-managed farms.

A set of "foodland guidelines" has now been issued, on which the OMAF is basing its review of local planning decisions. Municipalities are expected to adapt their future plans to the guidelines. The Northumberland, Simcoe-Georgian, and Sarnia-Lambton task forces, in developing strategies for growth to the year 2011, used the priority of conserving foodland as the primary consideration in planning. Huron County has developed a strategy with a broad agricultural perspective and the counties of Durham and Waterloo have designated agriculture as the primary land-use in rural areas.

The guidelines define lands with agricultural potential as:

1. Lands with a capability for the production of specialty crops.
2. Class 1 to 4 soils as defined in the Canada Land Inventory.
3. Additional areas where farms exhibit characteristics of ongoing viable agriculture.

4. Additional areas where local market conditions ensure agricultural viability where it might not exist otherwise (northern Ontario).[33]

Some of the steps outlined in the guidelines to divert urban development to less valuable land and to minimize its impact on agriculture are:

- The designation of high-priority agricultural lands in official plans to permit only farming or uses compatible with farming.
- The designation of land of lower agricultural priority where a broader range of alternative uses may be permitted as spelled out in the plan.
- The establishment of policies to ensure that disruption of farming by utility and communication lines is kept to a minimum.
- The adoption of the Agricultural Code of Practice and its minimum distance separation formula for keeping farm operations and rural residences apart.
- The identification of hamlets and villages that should be encouraged to grow.
- The establishment of buffer zones between urban and farming areas.
- The refinement of urban boundaries to show the direction, extent, and timing of future urban growth, so agriculture can be encouraged as an interim use.
- The establishment of new severance criteria related to long-term agricultural use, to divert severances away from foodlands.

The principal criticism of the guidelines is that they do not have the necessary force to be fully effective in saving valuable foodlands in the face of the determined pressure of municipalities bent on growth. The Bureau of Municipal Research outlined three key elements needed to support a provincial foodland policy:

1. A requirement that all municipalities with farmland resources make permanent agricultural designations within a specified period, not exceeding two years. These agricultural priority areas would have legislative protection. If municipalities fail to comply, the province should impose a blanket hold until the necessary planning policies are developed. These designations could differentiate between permanent agricultural areas and urban-rural fringe areas.
2. A commitment by the province to impose tougher restrictions where there is an obvious need – on land-use changes or on severances – so that the main objective of saving the remaining farmland in southern Ontario is not undermined while the planning is being done.
3. The application of a joint provincial-municipal rural planning process that would help to ensure that municipalities with farmland resources would incorporate agricultural concerns into their day-to-day decisions as well as their official plans or development strategies.[34]

The problem, as many writers have noted, is not so much with the farm community as with the urban communities, which tend to expand inexorably across the countryside, buying up foodland with the higher incomes enjoyed in urban areas. As they gain control of rural municipalities through the democratic process (by outnumbering farmers on local councils), a fundamental conflict develops between the long-term goal of reserving farmland and the short-term local government desire to permit development. This desire is increased as urbanites demand urban-level services and it becomes essential to expand the tax base and to create new employment opportunities. Thus the area of urban shadow expands until the necessary conditions for a farm community, composed of profitable farms, are destroyed.

For this reason, the Planning Act Review Committee recommended that "the Province should not allow municipalities to take actions which impair the achievement of provincial policies and programmes in economic, social, and physical development, in the protection of the natural environment and in the conservation and management of natural resources".[35]

The committee also stated:

> There is no doubt that in those cases where the Province decides it is necessary, the power to freeze agricultural or other rural land should be retained ... more or less as a last resort.... To provide a basic minimum level of rural zoning throughout the Province ... we propose that the Minister impose, universally, a "base level" rural by-law providing minimum rural zoning standards. He should be empowered to exempt from this by-law, by regulation, those municipalities that already have such by-laws, that adopt them in the future, or where such by-laws are not necessary or appropriate.[36]

Most observers agree, however, that regulation will not be enough. What is required is a renaissance of rural communities, and the development of a sense of confidence about the future in rural Ontario. As J.J. Shepherd commented recently in an introduction to a Science Council report:

> There are three issues which merit particular attention and concern and which are, I think, of unusual urgency:
>
> The first . . . is . . . much greater emphasis upon rural planning and development, beginning with the perception of rural life and resources, not as a residue to be salvaged after urban demands are satisfied, but rather as a sector of Canadian social and economic activity with its own distinct priorities and potential. . . .
>
> Second, the preservation of our best agricultural land must take precedence over the remorseless expansion of our cities and the ever increasing dead zone of the urban shadow which surrounds them. . . .
>
> Third, there is the perennial issue of the need for political will to supplant pious intention and cosmetic debate. Where issues such as the designation and preservation of agricultural land are concerned, political leadership is urgently awaited and long overdue.[37]

Ontario Hydro in Rural Ontario

Until the late 1960s, Ontario Hydro was probably Ontario's most respected institution. It was dedicated to the provision of "power at cost" to all residents of Ontario. It had accomplished the electrification first of industries and the cities and later of rural Ontario, with the full co-operation of all citizens. When Ontario Hydro requested an easement across a farm, the farmer gave it, trusting that Ontario Hydro was going through his farm for his own good and the good of other farmers.

In the late 1960s, this trust began to erode. There was a growing belief that large institutions become less and less responsive to their customers and owners as they grow in size, and become more dedicated to the security, profit, and power of their managers and employees.

At the same time, the government had made extensive efforts to centralize land-use controls and to remove from municipal control the power to plan local subdivisions. Century-old county structures disappeared and new regions were created. Township school boards were replaced with county boards. Each move was accompanied by higher tax rates and reduced local control. Tensions increased between the provincial government and lower levels of government.

Ontario Hydro had decided to create large energy complexes at Nanticoke and Bruce. Nanticoke required a 500 kV power line to link it with Pickering and Darlington and to allow for lines to be dropped into the metropolitan community from Hamilton to Oshawa. The Bruce complex required two lines – one from Bruce to Milton, the other from Bruce to London. All of the lines required the crossing of Ontario's best foodland and the Nanticoke-to-Pickering line required several crossings of the Niagara Escarpment. Both lines passed through the most valuable suburban foodland and recreational land in Canada, from Milton to Oshawa.

To purchase the land required for these lines, Ontario Hydro followed its usual procedures. It mapped out the most desirable technical routing for a line, conducting its affairs in secrecy to avoid affecting local land values, and then approached farmers privately with offers of purchase. If farmers did not want to sell, they were informed that approval had been gained from the municipalities and that expropriation would follow. Many farmers were upset by the secrecy, the low values placed on their lands, and the pressure from Ontario Hydro to move quickly.

Farmers and land-owners organized meetings to discuss the situation. They hired lawyers and land evaluators and soon began to realize that land values were rising rapidly, while Ontario Hydro was paying a market price that did not reflect this rapid rate of increase. They became aware that foodland prices were likely to rise much faster, as world inflation made land a collectable item, virtually immune to depreciation. The dollars they obtained for the land would decline in value, but the value of the land would increase.

Some farmers sold quickly to Ontario Hydro, with a minimum of bargaining. Those who waited, and bargained, and finally settled, often received five or six times as much as the first group. The disparity in settlements created an attitude of unrest and anger throughout the rural community. With it came a determination that in the future, no institution would alienate land from owners without full information about the impact of the line on the health of people and livestock, on farm operations and profitability, and on aesthetic and property values. Farmers could see the Ontario government buying more than 70,000 acres of land for land banks around North Pickering, Nanticoke, and Prescott, MTC widening highways, and utility companies building oil and gas pipelines and power lines across foodland. They faced the alienation of property rights on 2 million acres of land in the Niagara Escarpment

and 95,000 acres in the Parkway Belt. In addition, 26,000 acres a year were being severed from farming operations by rural residences and urban growth. At the same time, farm incomes were not high enough to enable farmers to compete with urban people for the ownership of what land was left.

There is little doubt that Ontario Hydro was arrogant and uninformative in its early negotiations. Rapid land acquisition with the least public information was a standard technique to acquire necessary land at the lowest cost, consistent with the mandate of Ontario Hydro. As long as land prices were constant, it was possible to price the land accurately. The farmer could move easily to nearby land at a similar cost. But with increasing pressure on remaining foodland, forcing farmers to move farther and farther north to find land comparable to the lands they had sold, and with prices inflated by high-priced land sales to developers and by a demand for urban residences, farmers found it impossible to relocate at the prices Hydro had paid them.

Ontario Hydro did not wish to share its plans with the public. No one had demanded such privileges in the past and Hydro saw no reason to divulge its long-term intentions. Only under mounting and concerted public pressure, backed by the Enquiries Act, has Hydro been forced to discuss its plans with the people of Ontario. Even the Select Committee of the Ontario Legislature has found it necessary to take special measures to obtain access to documents that are open to Hydro employees.

Ontario Hydro, because of its close contact with rural people, probably became the scapegoat for the Government of Ontario and for the insatiable demand for land which poured forth from the cities of Ontario. As urban Ontario began to buy up and dominate the countryside, Hydro's lines became a symbol of that wealth and domination.

The result has been a decade of inquiries, studies, and rural anger. Task Force Hydro, the Solandt Commission, the Royal Commission on Electric Power Planning, and the Select Committee are merely the most notable of the numerous inquiries into the operation of Ontario Hydro, its methods and practices, that have marked the 1970s.

For these reasons, the following technical discussion of Ontario Hydro's practices and procedures, its land holdings and their impact, may seem anticlimactic. Hydro uses only about 290,000 acres of Ontario lands of all types and most of the good foodland can be farmed in perpetuity under the lines. With the exception of perhaps 2,000 to 3,000 acres covered by towers, and up to 70,000 acres consumed by generating and transformer stations, it is permanently committed to farming. It is therefore difficult to know what all the fuss was about without recalling the collision between a new demand for public information and discussion and the ingrained habits of a secretive and rapidly expanding public utility that answered to no one.

Ontario Hydro's Use of Land

> The most visible aspect of Ontario's electric power system is the network of transmission lines which crisscross many square miles of the province. This is not surprising in view of the fact that the Ontario Hydro bulk power transmission system (the 500 kV, 230 kV, and 115 kV lines) traverses a total distance of 12,200 miles and together with the associated rights of way occupies about 200,000 acres of land. In a very real sense these lines are the electric power arteries which provide Ontario's industry, commerce and homes with electric power and all that implies.[38]

The circuit mileages projected to 1980, for the three basic voltages in the bulk power transmission system of Ontario Hydro are shown in Table 5.6.

Table 5.6 Circuit mileages to 1980

Voltage	Circuit miles
500 kV	1,571
230 kV	8,249
115 kV	6,739
Total	16,559

Source: "Transmission and Distribution". RCEPP Issue Paper No. 4, March 1977, p.6.

As the size of power generation centres increases and "right-of-way" requirements become more critical, the advantages of using 500 kV as compared with lower voltages become very marked.

Table 5.7 Right-of-Way Requirements (to transmit 4,000 MW for 100 miles)

Voltage (kV)	Capacity per circuit (MW)	Number of circuits	Width (feet)	Right of way acres per mile
115	30	133	5,025	610
230	140	29	1,200	145
500	2,200	2	200	25
765	4,300	1	135	15

Source: Walter Scott, "HV and EHV Transmission Planning". "Energy International", July 1972.

Table 5.8 Line Costs (excluding property and legal costs)

Number of lines	Per-mile cost ($)	Right-of-way width (feet)
One 2-circuit 500 kV	600,000	250
Four 2-circuit 230 kV	1,200,000	530
Seven 2-circuit 230 kV	2,100,000	950

Source: O.M. Solandt, "Bulk Transmission of Electric Power", in "Our Energy Options". Toronto: RCEPP, 1976.

A less visible part of the Ontario Hydro system is the generating station system that feeds the provincial transmission grid. Although most of these stations are located on prime agricultural land, their total acreage is not extensive. In fact, the total land area covered by both transmission lines and generating stations is not large in relation to some other users of foodlands, and if the fact that farming can continue under the transmission lines is taken into account, the true acreage loss becomes smaller still.

Table 5.9 Comparative Acreage Required

Ontario Hydro bulk transmission system – 200,000 acres
Pickering Airport land freeze – 85,000 acres
Mirabel Airport – 88,000 acres
Area occupied by Bruce Nuclear Power Development – 2,300 acres
Area occupied by Lakeview Generating Station – 144 acres
Land lost by agriculture in Ontario each year in 1966-71 period – 26,000 acres
Estimated foodland affected by towers – 2,000-3,000 acres

Source: RCEPP, Ontario Hydro, and private communications.

Nevertheless, Ontario Hydro's approach to the selection of generating sites and routes for transmission lines has come under constant attack by farmers, environmentalists, and holders of rural recreational and development land. Public anger has slowed the process of land acquisition and delayed the delivery of power to load centres. Concerns range from the reliability of Ontario Hydro's forecasts of future power requirements to the belief that Hydro is dominating land-use planning by its selection of new sites for energy parks.

> Power generation has social costs in the sense that it has undesirable side effects (costs) which are not paid for directly, completely and voluntarily by power users. Instead, these costs are distributed over neighbouring populations, independently of the distribution of power use. Since they are not directly faced by users, they do not directly influence power demand; hence both power demand and attendant social costs may . . . be higher than they would be in an ideal market economy. A power company which was only interested in producing electricity at the lowest possible monetary cost would not be concerned with these social costs.[39]

Even if present social and economic costs and benefits can be apportioned equitably, many questions have been raised about the long-term consequences of locating very large generating stations at great distances from urban centres, e.g., using large nuclear stations to generate the power rather than smaller stations closer to the points of demand. The long-term effects of Ontario Hydro's policies on the shape, structure, and competitiveness of the province's agricultural and industrial base have also been widely discussed.

> Even more important issues for the future concern questions of equity – the consequences to future generations of present policies with respect to resource consumption and environmental protection. Are future generations being penalized for power which is being consumed by the present generation? What will be the environmental preferences or goals of future generations? Is there any way to take into account, in present decision-making, consequences and effects which may only be felt generations or centuries from now?[40]

Philip Hill set out criteria for public participation in power planning:

- The reasons for selecting certain effects as the major social costs of power generation must be identified.
- The state of knowledge of these effects, including the range of and reasons for uncertainty, must be determined.
- The results must be amenable to critical examination by specialists.
- The results must be communicable to non-specialists.[41]

Perhaps the most serious charge made by critics is that "Ontario Hydro has become a bureaucracy run not for the customer but for the bureaucrats themselves". Numerous briefs to the RCEPP questioned whether the various ministries of the Government of Ontario really are aware of and involved in Ontario Hydro's overall land-use planning strategy and whether they could affect the strategy or decisions based on it, if they wished to do so. Even if there was collaboration at the provincial level, how could local and regional municipalities incorporate their concerns and plans into the plans of Ontario Hydro?

Ontario Hydro's response is that continuous and detailed co-operation takes place at all levels, from detailed joint planning with local municipalities and their utilities to route and site selection consultation with counties and regional municipalities, and continuous liaison between senior officials and their counterparts in the various ministries responsible for provincial goals and plans.

> At the highest level, the President of Ontario Hydro is a member of the Advisory Committee on Urban and Regional Planning, the key group within the Provincial Civil Service for the co-ordination of various components of the Regional Development Program. This committee consists of key Deputy Ministers of concerned Ministries. Through this Committee, major items such as the development of new town sites, reports on regional development and recommendations for development strategies for various parts of the Province are reviewed. Upon review, the Committee makes recommendations to the Cabinet Committee on Resources Development. The Cabinet Committee co-ordinates the planning activities of major Ontario Hydro projects with other agencies in the resources development policy field.[42]
>
> In the planning of new facilities, Ontario Hydro argues that it takes into full account the conservation of agricultural land, the provision and conservation of community and recreation areas, and, through public participation procedures of an elaborate kind, the views of smaller municipalities and individual residents. All existing and proposed land-use plans at the municipal level are reviewed and taken into account in Hydro planning.[43]

Ontario Hydro further argues that extensive study has been given to the impact of transmission lines on agriculture. These studies have shown that the major impact on agriculture is a loss of crop potential because of the space occupied by towers, damage caused during construction, the interference caused by towers to optimal farm operations, and weed growth around the base of towers.

In addition, towers result in a loss of machine efficiency and are a potential cause of injury to persons, machinery, and equipment. However, Ontario Hydro argues that it has modified its procedures to take these costs fully into account during route selection studies and points to the conclusion of the Environmental Hearing Board with respect to the Bruce to Milton transmission line:

> In summary, from its own review and field studies, the Board concurs with the findings of the Solandt Commission, that the impact of power transmission lines upon agricultural food production is relatively small on a regional or provincial scale. However, the impact upon an individual farming operation can be more severe and must be adequately compensated.[44]
>
> Ontario Hydro believes that suitable land is available for facilities while recognizing that there are competing uses for land. It further believes that its facilities can exist in harmony with many other land uses. It recognizes an obligation to achieve this to the maximum possible extent. To accomplish this, Ontario Hydro has collaborated with a working group on agricultural land to prepare the report: "An Approach to Classifying and Ranking Ontario's Foodlands", and is using the land classification from this report in the preparation of its alternative plans.[45]

Ontario Hydro argues that it is necessary to accommodate future urban growth by providing power where it is needed. This means that a variety of options must be available, so that, regardless of where and when the growth occurs, there will be suitable generation sites and transmission corridor alternatives available, approved, and incorporated into local official plans.

Ontario Hydro further believes that, to facilitate this process, it should acquire the lands and, having gained approval at all levels for their use, have them zoned for exclusive Ontario Hydro use. Existing or

other uses could then be continued until the facilities were required. Only at the time the site was to be used would a review take place under the Environmental Assessment Act.

To minimize the use of land for generation and transmission, Ontario Hydro argues that energy centres of at least 12,000 MW should be developed, rather than large numbers of smaller generating units around the province.

Ontario Hydro's Land Holdings[46]

Ontario Hydro's transmission system, on December 31, 1979, consisted of over 12,000 miles of transmission line carrying 115 kV or more. Of the 200,000 acres of right of way that were involved, Ontario Hydro owned about 50,000 acres and held 150,000 acres under easement. Rights of way for 500 kV lines include additional lands for future lines, so additional land acquisition will not be required at that time.

It should be noted that the transmission corridor acreage of about 70,000 acres is not removed from agriculture; indeed, much of it is permanently locked into agricultural use by the existence of the power lines. Only lands required for footings, enclosed within guy wires, or lost in cultivating around the towers, can be said to be removed permanently from foodland totals.

Ontario Hydro estimates that total acreage of improved agricultural land removed permanently from cultivation by tower structures themselves now amounts to between 2,000 and 3,000 acres. This figure includes land that cannot be cultivated as a result of tower bases but does not include inconvenience or added operating costs resulting from the location of the towers.

On the basis of a "worst case" travel pattern for farm machinery around a tower, Ontario Hydro estimates that a maximum of one-tenth of an acre can be lost for each large tower, placed in the centre of a field. On this basis, and recognizing that about 3,730 miles of high-voltage transmission lines are believed to be over active cropland in Ontario, with an average of six towers per mile, the total area affected could be in the order of 2,250 acres.

In two studies, conducted by the Ridgetown and Kemptville agricultural colleges in 1977, and covering crop losses due to towers for such crops as corn, soybeans, and wheat, it was established that the actual cost of the presence of a large tower could range from $12.64 per acre per year in wheat to $28.28 per acre per year in corn silage, in the Ridgetown area. Losses for all crops were considerably lower in eastern Ontario.

Minimizing the Effects of Ontario Hydro on Foodland

> In general, the province must keep the broader issues in mind. It must not interfere with Ontario Hydro in its job of producing power, but must stand by to mop up when Ontario Hydro leaves problems behind.[47]

In its efforts to minimize the negative effects on rural Ontario, Ontario Hydro has developed what may be the most extensive inventory of rural lands that exists in the province. It has a large team of specialists in such fields as land evaluation and acquisition, site selection, and land banking. These specialists are capable of negotiating the thicket of provincial regulations, public participation, social and economic impact assessment, environmental assessment, and public relations. Indeed, the very excellence of the Ontario Hydro team appears to have become a concern to less-well-equipped elements within the Ontario government, and to lower-tier municipalities and individuals.

The specialists have refined the various processes from the early identification of suitable sites for future generation plants, through the production of detailed environmental and social impact statements, to the assessment of potential agricultural productivity in various parts of the province.

If power demand continues to lag behind the development of generation capacity, as a result of conservation measures and higher prices for electric power, it is possible that existing sites, when fully developed, will be capable of providing all the power Ontario will require until early in the next century. If, in addition, existing 115 and 230 kV transmission corridors can be upgraded to 500 and 750 kV, largely within the existing rights of way, very few additional miles of new power corridors may be required, to deliver power from generation sites to demand centres. In the meantime, the identification of new potential sites and corridors continues.

As indicated in the preceding chapter, extensive consultation has taken place between Ontario Hydro, the farm organizations, and the Food Lands Development Branch of the Ministry of Agriculture and

Food. The work to date has consisted of assembling existing data on Ontario foodlands in map form to indicate areas of high and low priority for agriculture.

In addition, the Ministry has prepared guidelines to assist Ontario Hydro in determining the location of generating stations and transmission lines.[48] These include practices to be followed during the construction and maintenance of transmission lines to minimize the adverse effect on agriculture.

The basic objective is to stay off foodland if at all possible. Where it is necessary to build on foodland, the Ministry says, the land should be disrupted as little as possible and restored to its original state. The land-owner should be adequately compensated for disruption and damages.

The same basic format is used as with pipelines, highways, and other facilities. Uniform performance is required of all construction companies that build facilities on foodlands.[49]

The Ministry says that the following types of land should be retained for agricultural production:

1. Lands with a high capability for agriculture.
2. Lands capable of production of specialty crops such as fruits and vegetables.
3. Lands with an advantageous climate for crops.
4. Lands suitable for use as buffer lands between livestock operations and other uses.
5. Lands where farms exhibit characteristics of viability such as good management practices, high economic return, and secure tenure arrangements.
6. Land where local market conditions ensure agricultural viability where it might not exist otherwise.

In the view of the Ministry of Agriculture and Food, Ontario Hydro facilities should be located:

1. where land has low capability for agriculture.
2. where transmission lines pass over as little prime foodland as possible.
3. on lands irreversibly transferred to non-agricultural use.
4. to provide incentive for development away from foodlands.
5. where associated development will not impinge on prime foodlands.
6. where multiple-use corridors are established for the grouping together of line facilities (highways, pipelines, etc.).

Table 5.10 Linear Land Uses – Comparison of Features

	500 kV transmission line	Pipeline	4-lane controlled access expressway	Railway
Right-of-way width (typical)	250 – 600 feet	60 feet	150 – 300 feet	60 – 100 feet
Effect as physical barrier	Minimal except at towers (every 900 feet)	Minimal	Yes	Yes
Secondary uses of right of way				
Farming	Yes	Yes	No	No
Forestry/orchard	Yes (with 25-foot height restriction)	No	No	No
Local noise	Not serious	None (except at pumping stations)	Considerable (often serious)	Intermittent
Atmospheric pollution	Negligible (ozone)	No	Yes	Intermittent
Visibility (at a distance)	162-foot-high towers and lines, often visible at great distance	Limited and local	Limited and generally local	Limited and generally local

Source: Power Authority, State of New York, 1977.

The following guidelines were developed by the Ontario Ministry of Agriculture and Food in co-operation with Ontario Hydro to minimize disruption of and damage to foodlands:

1. Transmission lines across foodland will be on fence or property boundaries and will not go diagonally across farms, except in cases where a diagonal crossing would have less total impact.
2. Ontario Hydro will provide the land-owner/tenant complete details as to the routing, and the land required, at least four weeks prior to signing an agreement for the right-of-way/easement/temporary working rights, unless otherwise decided by the owner.
3. Ontario Hydro will ensure that construction starting dates are given to the land-owner/tenant when property acquisition negotiations commence. This should be approximately 12 months in advance of the earliest possible starting date and it should be rescheduled when more definite dates are known or as required by the owner.

4. Ontario Hydro will remove and stockpile the topsoil from each tower site and permanent access road, before construction begins, except when seasonal conditions do not permit, or in the installation of augured footings in places where the removal of the topsoil could result in greater damage to the soil than if the topsoil were left in place.
5. For augured footings, Ontario Hydro should, unless requested otherwise by the owner, spread excavated soil beneath the tower as mutually agreed with the land-owner/tenant. When construction is completed, excess excavated material, stones, construction debris, and brush will be removed and disposed of in a manner mutually acceptable to Ontario Hydro and the land-owner/tenant. The topsoil will be replaced and the area under and around each tower reseeded as mutually agreed with the land-owner/tenant.
6. Construction scheduling, construction equipment, and techniques to minimize soil compaction will be utilized where practical. Alternately, an allowance in money will be negotiated with the land-owner/tenant to compensate for the cost of chisel plowing and/or other techniques such as selective cropping which may be necessary to relieve soil compaction and restore productivity on the right of way.
7. Ontario Hydro will be responsible for the damages occasioned by and the costs of supplying and placing topsoil to maintain surface control under and around each tower as necessitated in subsequent years.
8. If requested in writing by the land-owner/tenant, towers located in croplands will be suitably marked so that the operators of farm machines can more readily see them and avoid collision with them during night operations.
9. Reasonable steps will be taken by Ontario Hydro in conjunction with the land-owner/tenant to locate tile drains prior to the entry of construction equipment. If known before tower location is established, tile drain locations should be taken into account.
10. Prior to commencement of construction, provision should be made for temporary surface draining during construction and for protection of existing tile drains. Appropriate soil stabilization techniques will apply.
11. Ontario Hydro will be responsible for repairing or replacing surface and sub-surface drains damaged during construction and maintenance. If repair is necessary, the method of repair should be demonstrated to and approved by a representative of the Ontario Ministry of Agriculture and Food and the land-owner/tenant.
12. Ontario Hydro will be responsible for any increased costs caused by the presence of a transmission line whenever future crossings for municipal or private drainage works are necessary. The increased costs should include an amount for loss of crop production.
13. Prior to any Ontario Hydro activity, Ontario Hydro will negotiate for right of access to the right-of-way/easement/temporary work area.
14. Unless exempted by the land-owner, Ontario Hydro will provide an access route across the right-of-way/easement/temporary work area at all times for the land-owner, his equipment, and animals.
15. During construction, Ontario Hydro will provide temporary fencing as necessary to protect livestock and crops. An allowance, sufficient to cover expenditures on feed and water necessitated by loss of access, should be provided. Loss or damage to livestock resulting from temporary fencing improperly erected by Ontario Hydro will be the responsibility of Ontario Hydro.
16. Ontario Hydro will be responsible for the repair of farm roads, lanes, or other right of ways damaged through obtaining access to the right-of-way/easement/temporary work area.
17. Ontario Hydro will compensate the land-owner for any crop loss caused by construction or through obtaining access to the right-of-way/easement/temporary work area.
18. All fences and/or gates opened or removed will be replaced or repaired in a manner negotiated with the land-owner. It is understood that Ontario Hydro will install permanent gates on fences crossing the right of way, as required. It is also understood that Ontario Hydro will install and maintain fence grounding as necessary.
19. Loss or damage to livestock resulting from improper replacement or repair of fencing will be the responsibility of Ontario Hydro.
20. Ontario Hydro must maintain the right to enter on farm lands at any time for emergency repairs or maintenance purposes. Ontario Hydro will endeavour to contact the land-owner/tenant to inform him of the need to gain access for the repair. Reasonable care must be exercised to minimize soil and crop damage. All damages caused during such occasions will be repaired or compensated for as negotiated with the owners/tenants affected.

21. (a) Ontario Hydro will be responsible for damages or disruption caused by Ontario Hydro in subsequent years for as long as the transmission line is in use. Compensation may be paid for: crop loss in subsequent years due to low productivity related to impaired drainage, damage to the soil profile or soil structure, and to compaction; and damage caused during inspection, maintenance, modification, or repair of the transmission line in subsequent years.

(b) Ontario Hydro will be responsible for obtaining a mutually acceptable third party for resolving unsatisfied claims.

Land Banking by Ontario Hydro

The need for generation sites for Ontario Hydro's planned expansion was debated extensively during the RCEPP hearings. In earlier expansion plans Ontario Hydro called for between five and seven new generating stations in Ontario. It was further argued that, if Hydro is to plan far enough ahead of actual need to obtain all necessary approvals and to design and construct the units, it will need, by the year 2000, to have identified enough additional sites to accommodate power needs to the year 2013. Beyond that point, it seems difficult to forecast and foolish to make firm plans, since technologies may have changed by that time and the mix of sources for power may be quite different.

The total space requirement for a site capable of accommodating two generating stations (four units per station) plus heavy-water facilities, is about 4,000 acres. The area depends on the number and type of facilities and their relationship to topography and the configuration of the shoreline.

The space required is derived from the following considerations:

1. A coal-fired station's largest space requirement is for ash disposal – about 250 acres, assuming a 3,000 MW station with a 30 per cent annual capacity factor. About 850 acres more are needed for the powerhouse, switchyard, fuel storage, and construction facilities.
2. A nuclear station requires only about half that area because it does not need fuel storage and ash disposal areas. However, the Atomic Energy Control Board specifies that an area within 915 m of the reactor (the exclusion zone) be under the direct control of Ontario Hydro. Applying this criterion to a waterfront site results in an area requirement of approximately 850 acres.
3. The space required for heavy-water production facilities similar to those at the Bruce Nuclear Power Development is approximately 125 acres (45 ha). However, the Atomic Energy Control Board specifies that an area within 1.6 km of the plant be under the direct control of Ontario Hydro. The application of this last criterion to a waterfront site results in an area requirement of approximately 2,500 acres (950 ha).
4. Since it is possible to install certain nuclear facilities within mutual exclusion zones, the combined land requirement is less than a simple addition of the individual facility requirements. Bearing in mind that layout arrangements are site-specific, an area of approximately 3,500 to 4,500 acres (1,420 to 1,620 ha) is required.[50]

In selecting the site, factors such as road and rail access, topography, geology, seismicity, and water supply must be taken into account, and transmission, switching, and transformer facilities must all be accommodated.

Access requires a paved, year-round highway, linking the site to the nearest provincial highway. Rail access is needed for fuel and heavy equipment transportation. Marine access is essential for a coal-fired station and desirable for a nuclear station, to allow barges to bring in heavy equipment and remove spent nuclear fuel. Coal ships require adequate depth at dockside and in the channels.

The ideal topography provides a secure location about 3 m above high water to minimize the pumping of cooling water. Large volumes of water are needed for cooling.

Up to 890 m^3 of water per second will be required for an energy centre. The supply source must be dependable during the life of the facility.

A transmission system must be designed to carry peak loads, with reserve capacity to accommodate forced outages or failure of components. Ontario Hydro is a member of the Northeast Power Coordinating Council which has uniform criteria pertaining to the amount of transmission provided by member utilities and to the operation of the system, since trouble in one system will affect the systems of other utilities.

Such sites are difficult to find, particularly in view of the extensive development along the Great Lakes,

where water is available. As a consequence, Ontario Hydro has followed a policy of identifying and controlling suitable sites many years in advance of needs.

Sites with substantial undeveloped capacity have been purchased by Ontario Hydro at Bruce, Lennox, Darlington, Wesleyville, and Lambton. Hydro has undeveloped property in Clarkson (Mississauga) and at Delphi Point on Georgian Bay.

In addition, the Ontario government owns extensive areas of land, some of them suitable for future power generation sites. The Ministry of Natural Resources owns extensive "park reserves" and the Ministry of Transportation and Communications has identified or owns extensive acreages for future highways.

The federal government also owns land suitable for power sites, such as the Meaford military range.

On sites currently owned or controlled by Ontario Hydro or the Ontario government there is space to produce a further 52,000 MW. This would allow Ontario Hydro to more than triple its present thermal capacity of 16,000 MW.

Table 5.11 Ontario Hydro Comparative Site Data

Hydro/Government site inventory	Area of site acres (ha)	Total site maximum generating capacity (MW)	Generating capacity committed to date (MW)	Generating capacity remaining on site (MW)
Darlington	1,124 (455)	12,000	3,400 (4 X 850)	8,600
Wesleyville	1,700 (688)	12,000	1,000 (2 X 500)	11,000
Lennox	1,500 (607)	12,000	2,000 (4 X 500)	10,000
Iroquois East	1,500 (607)	12,000	–	12,000
Chats Falls	1,050 (425)	2,400	–	2,400
Edwardsburgh	10,000 (4,046)	8,000	–	8,000
Total		58,400	6,400	52,000

Source: Ontario Ministry of Energy

There are two alternatives open to Ontario Hydro in banking land for future facilities:

1. Purchase or negotiate easements after the environmental assessment process.
2. Designate certain lands in the official plans of local municipalities under the Planning and Development Act. This is done by MTC for future highway routes.

The major difference between the two methods lies in the timing of the actual purchase or easement negotiation. Using the second method, this occurs only after the site has been identified and construction timing for the site or route has been decided. Land-use is restricted to the use in effect at the time of designation, and, by "designating" the land, it is banked for a public use. Acquisition costs are only incurred for properties about to be developed.

It is not clear which course Ontario Hydro is currently pursuing.

Disadvantages of Land Banking

It is extremely difficult to predict future power generation requirements in Ontario, particularly past the year 2000. Ontario Hydro at present has site and route capacity to provide facilities to the year 2,000, and, assuming lower growth rates in power demand, current site capacity could be adequate to an even later date.

Even if growth in demand takes place in traditional areas, it is extremely difficult to forecast the timing of the need for new generating capacity at a particular site accurately enough to assist local planners to identify impacts and to plan mitigating actions.

Land banking will, for indefinite periods of time, severely restrict land-use on properties acquired for the bank. It will also have effects on surrounding land-use. If, as Ontario Hydro argues, the chosen site will not have the effect of attracting industry, it is possible that it will actually repel it, because of the psychological effect of future proximity to a nuclear or fossil-fuelled plant.

If banked property cannot be used or sold, it will become an unrecoverable capital cost to Ontario Hydro. Even if it is used, its value may not increase rapidly enough to provide a higher rate of return to Ontario Hydro than the cost of the capital borrowed to pay for it. This is particularly true of transmission routes, for which Ontario Hydro pays market values as well as an additional amount for injurious affection. (At the moment Ontario has $311 million invested in land and is paying $28 million each year in interest charges. Most observers estimate that, at current prices, the province would incur heavy losses if the land were sold.)

There is little doubt that citizens will react to the choice of a site by Ontario Hydro, whether it is merely "banked" for the very long run or is about to be used for generation or transmission. Whether the reaction is positive or negative, it will lead to major public unrest if it is not related to measurable need by the people of Ontario in the near future.

Advantages of Land Banking

Four important benefits result from a policy of banking routes and sites:

1. It is possible to reduce planning lead time by identifying and buying sites and routes in advance. At least three years could be removed from the present lead time of 13 years for nuclear facilities.
2. The shorter lead time allows senior decision-makers and the public to respond directly to the need for the new facility, since concern shifts from supplying a system load 13 years from now to supplying a load 10 years in the future.
3. By banking alternative sites, Ontario Hydro could reduce the possibility of being blocked for long periods (as in the Bruce-Milton transmission line).
4. A land-banking policy would provide municipal and provincial planners with a more accurate view of future Ontario Hydro plans, since land-uses would be more clearly and firmly identified.

Long-Term Requirements for Facilities on or over Foodlands

Ontario Hydro has sufficient land in sites it already owns to accommodate an additional 52,000 MW of fossil or nuclear generating capacity.[51] This "land bank" would allow Ontario Hydro to triple its present thermal power capacity of 16,000 MW and, even if the projected growth implied in Load Forecast 48A were to be realized (7 per cent per annum), the present sites would accommodate it well into the next century. If these growth rates do not materialize and Ontario Hydro's newer 4.5 per cent expansion plan is followed, the present "land bank" will suffice until the year 2030 or beyond.

However, Ontario Hydro continues to seek out new sites and to assess the various potential transmission corridors between them and the points of demand. An extensive route- and site-selection group exists with the purpose of developing a very long-term land bank, capable of providing a wide variety of site and route options for use when they are required.

If there are other demand estimates within Ontario Hydro, or assumptions about future land costs, these should be made explicit. The past decade has been a period when Ontario Hydro's involvement in land transactions has been intense, reflecting the linking of such distant sites as Bruce with the load centres, and linking various large new generating sites near the COLUC complex with each other (Nanticoke to Pickering, etc.). These corridors have been designed to serve multiple lines, and arranged to minimize foodland impact and aesthetic interference. Purchases and easements have been negotiated that should accommodate power requirements at least to the end of this century. (The possible exception may be a Bruce-to-London 500 kV line.) Existing transmission corridors, now carrying 115 kV, can be upgraded to 500 or 765 kV, especially if new technologies can be developed that allow the narrower corridors to carry more power. (It should be noted, however, that farmers who testified at the RCEPP hearings opposed higher-voltage lines on the ground that they could present a hazard to equipment operators under the lines.)

The goal of Ontario Hydro to produce power at least cost should not include the banking of land as an end in itself. Instead, Ontario Hydro engineers should focus on improving the technology of transmission systems so that less land is used, within the constraints of safety and reliability. The past decades of rapid accumulation of land would then be seen to be a once-for-all assembly of the necessary generation and corridor resources, capable of providing the Ontario grid with power for nearly a century.

The Effect of Ontario Hydro Transmission Lines on Property Values

There is a strong belief among land-owners in Ontario that a power line has the effect of reducing land values within sight of the line. Ontario Hydro has commissioned several studies to determine whether there is a measurable effect on land values.[52]

To obtain further evidence, the RCEPP commissioned several studies as well.[53]

In general, the Ontario Hydro studies show no measurable effect on the value of either agricultural land or estate residential land as the result of the location of transmission corridors over the land or within sight of it.

However, the findings of a team from the University of Waterloo are somewhat different and appear to merit attention. This team produced its first report in 1976, for the RCEPP. The report provided a substantial amount of information and formed the basis for later studies. The initial study showed strong negative attitudes towards the construction of power lines by people not directly affected by the lines. These feelings appeared to be much stronger than the feelings of people whose property was actually crossed by the lines. The first study also turned up no significant difference in land values between a control area some distance from a power line and the land actually crossed by the line.

The University of Waterloo team produced a second study in 1978. It was larger in scale and included both an older 230 kV line and a new 500 kV line. The lines studied were the 500 kV line between Essa and Kleinburg and the 230 kV line between Essa and Orangeville. The lines are of different age, voltage, and physical size. An attempt was made to identify the influences of these factors on the social and economic impact of the lines.

The "control-lines" – corridors on which there was no power line, – were located 1.5 km to the east of the existing lines. A careful comparison was made between the power-line corridors and the control corridors to ensure that there were no other significant differences that could account for different results. No significant differences were found.

A total of 1,007 transactions between 1967 and 1977 were analysed. Data from regional registry offices were used to examine patterns of frequency of sales and average prices per acre for different sizes and types of property. The 500 kV line showed an increase in sales during the period of land acquisition for the right of way, but otherwise the frequency of sales on both corridors fluctuated in a pattern similar to that of the real estate market as a whole. Properties near the line corridor had consistently lower average prices per acre than properties on the control corridor. Prices were lower by up to 29 per cent, with the greatest depreciating effect on small properties and the least effect on large parcels (100 acres and up).

A total of 108 individuals on both lines and controls participated in the survey. Participants were asked a number of factual questions about their perceptions, attitudes, and opinions regarding transmission corridors and their impact. A community profile was constructed from these responses.

Individuals located on a power line "appeared to be somewhat negative in their attitudes to hydro lines but showed strong evidence of adjustment".[54] A large proportion of the control group (located 1.5 km from a line) "showed an unwillingness or an inability to express opinions. Their responses tended to be ambivalent and somewhat contradictory." The study concluded that direct personal experience is a more important factor than proximity to a line in the formation of perceptions and attitudes.[55]

There were few differences between the responses from the two study areas. The study concluded that "the impacts of transmission corridors do not appear to be influenced by the age, voltage or physical size of the line".[56]

The study also concluded:

> Hydro lines appear to meet with the strongest opposition during the planning and construction phases but once in place become neutral components of the landscape. The affected public's consciousness of their impacts tends to diminish over time. The most significant continuing impact appears to be the effect of the presence of the corridor on the market value of property.[57]
>
> In the past the affected public has adjusted and adapted to the impacts of hydro transmission facilities. It is suggested, however, that with the current level of public consciousness of the issues related to power generation and transmission, similar adjustment might not be expected to continue in the future.[58]

Table 5.12 Average Price per Acre by Size Category

500 kV study area	500 kV line	500 kV control	Difference (line vs. control)
Small (under 10 acres)			
Frequency	96	141	
Average price per acre ($)	30,024	42,300	−29.0%
Medium (10-49.9 acres)			
Frequency	158	104	
Average price per acre ($)	1,340	1,832	−26.9%
Large (over 50 acres)			
Frequency	57	70	
Average price per acre ($)	679	881	−22.9%
230 kV study area	**230 kV line**	**230 kV control**	**Difference (line vs. control)**
Small (under 10 acres)			
Frequency	61	79	
Average price per acre ($)	17,554	24,844	−29.3%
Medium (10-49.9 acres)			
Frequency	85	69	
Average price per acre ($)	1,236	1,682	−26.5%
Large (over 50 acres)			
Frequency	48	44	
Average price per acre ($)	956	1,147	−16.7%

Source: Boyer, et al, "The Socio-Economic Impacts of Electric Transmission Corridors – A Comparative Analysis", University of Waterloo, 1978.

In the literature search conducted by the University of Waterloo team, few examples of similar effects on property values were found. In general, in residential and in purely agricultural areas, property values appeared to be unaffected by proximity to a power line. It appeared that the unusually large gap in the Waterloo study between property values on a power line and distant from it could be related to the rural residential character of the area. Urbanites searching for a small parcel of land in the country on which to locate a home regard highly such qualities as scenery. Comments included: "If I couldn't see the tower, I would buy the land", "[The proximity of towers] affects the market value of residential homes more than farms", and "[I] would not buy property with towers."[59]

However, there was no indication that property-owners were disposed to sell their land after the hydro line had been built.

The studies reviewed by the University of Waterloo team also indicated that farmland values are affected less when agriculture is the chief use of the land, with little prospect of urban development, and when parcels are large. The studies did reveal farmer concern, however, with loss of land around the tower bases; with loss of time in circumnavigating towers with large equipment; with crop damage through soil compaction, herbicide buildup, and weed encroachment; and with multiple corridors, especially when various types of towers are used in parallel corridors.[60]

It was therefore recommended that Ontario Hydro take the following steps:

1. If towers must be placed in the middle of fields, they should be oriented in the direction of fieldwork.
2. Bisecting farms should be avoided.
3. Towers should be placed in the fencerows, whenever possible.
4. Effects on farms should be reduced by keeping unproductive areas near towers to a minimum and, ideally, by placing towers in rough areas.
5. Studies should be undertaken to examine the psychological effects of towers on machine operators.[61]

Health and Safety Aspects

An extensive review has been conducted of the literature on electromagnetic effects of power lines on people who pass under or near them.

While some Russian studies appear to show deleterious effects, all North American studies "claim that effects do not exist or are too small to be significant".[62] The University of Waterloo team concluded that most of the studies finding harmful effects "had flaws in their methodology which makes their results questionable".[63] Their study concluded:

It can be said that the overwhelming bulk of scientific information gathered to date indicates an absence of deleterious biological effects ranging from genetic to behavioural areas in plant, animal, and human subjects. Certain effects, such as ozone production, shocks, noise, and radio and television interference can be annoying, but are far from dangerous and often unavoidable. In response to public concern over these effects, Ontario Hydro has established a Demonstration Centre at Essa, where most of the problems mentioned here are explained and possible hazards are demonstrated along with techniques for alleviating any apparent danger. However, ruling out possible dangers would be a mistake and open-mindedness must be maintained. Any effects would be very difficult to pinpoint and studies must be extensive and rigorously controlled in order that results be as reliable as humanly possible.[64] This matter is considered at length in Volume 6 of this Report.

Aesthetics in Corridor Planning

The University of Waterloo report examined the guidelines followed by Ontario Hydro in its attempts to place lines "where people will be least upset". Some of the guidelines are:

- Avoid crossing over or going near roads that have steep vertical slopes.
- Avoid crossing through well-defined enclosed spaces.
- Avoid crossing near intersections on roads.
- Avoid crossing perpendicular to a sequence of lines in sight of a landmark.
- Avoid silhouetting on the horizon.[65]

Ontario Hydro has used the following method in planning new corridors:

Visual analyses are undertaken, composed of four interlocking methodologies:

- A visual analysis that operates at a provincial scale to assist in establishing study area boundaries by determining . . . the large, visual, high-constraint area.
- A visual analysis that operates at a regional scale within a defined study area to assist in determining broad-band corridors (1.6 to 16 km in width) which link load centres to generation sites.
- A visual analysis to assist in the location of the actual route of the proposed transmission line within the previously designed course corridors.
- A methodology to assist in the determination of remedial measures to minimize the predicted visual impact.[66]

Ontario Hydro thus attempts to predict the visual impact of any changes, by examining the process by which man recalls images of his environment. Planners attempt to make trade-offs among physical, ecological, planning, and aesthetic limitations, while facilitating the demands of pressure groups.

Pacific Gas and Electric Company of San Francisco undertook extensive research to accomplish similar objectives. The company believes that "man-made" facilities of any type can be designed and sited in the landscape without creating significant negative visual impact, except:

- when lines are visible in areas officially designated for the preservation of scenic values
- when lines are located in areas prone to long-term scars and swaths as a result of grading or clearing operations
- when parallel lines are not co-ordinated or when the number of lines becomes visually dominant
- when lines are not compatible or in scale with the major visual patterns or features of their setting
- when lines occupy a major portion of the viewed landscape
- when more than one line or a co-ordinated set of lines is visible from any one viewpoint.[67]

Visual conditions that will cause a line to have an adverse visual impact are then identified and mapped and used, first to determine alternative planning corridors, then as indicators of impact coincident with the alternatives, and then to compare the relative merits of the alternatives. Through a series of ratings, and by the process of elimination, the best corridor route is selected. The whole process is based on an individual visually assessing a landscape.[68]

The study recommended that a wide variety of techniques be used to make corridors aesthetically pleasing, including single-pole tower designs and an imaginative use of natural vegetation. "The basic solution . . . is to plan the corridors and design the structures with the environment."[69]

The Use of Waste Heat in Agriculture and Aquaculture

The efficiency of large nuclear or fossil-fuelled electric plants is about 30 per cent. This means that, of the units of energy in the fuel, only 30 per cent are transmitted from the plant in the form of electricity. The rest are transferred to a "heat sink" – either a nearby body of cold water or a cooling tower. With an abundance of cold water available for cooling, Ontario's power plants rely on the Great Lakes.

Studies have been made to determine whether the enormous volumes of waste heat generated by large plants could be used in district heating systems, to heat greenhouses for food and flower production, or to heat ponds for the development of fish for stocking the Great Lakes system.

The Ontario Ministry of Energy has provided funding and support for several studies to determine the feasibility of using waste heat at the Bruce and Pickering nuclear sites for agriculture and aquaculture. Detailed feasibility studies were undertaken in 1977 and private firms have been invited to bid for the right to purchase volumes of waste heat. A pilot greenhouse project is currently under test at Bruce to determine the commercial feasibility of a large-scale project.

The Kincardine Waste Heat Project

This waste heat utilization project began as a result of a search by residents of Kincardine for a stable industrial base for the area. A committee was established, and it travelled to Minnesota to visit the Sherco Greenhouse Project undertaken by the Northern States Power Company and to Romania to view large-scale greenhouse operations fuelled by waste heat from generating stations. A brief was prepared and submitted to the Ontario government early in 1977. A steering committee was organized, including representatives from the Ministry of Energy, the Ontario Ministry of Agriculture and Food, and the Ministry of Natural Resources, together with representatives of Ontario Hydro and local municipalities. The steering committee called for a feasibility study of the concepts as they related to the Bruce Nuclear Power Development and the surrounding area, and the feasibility study was awarded to Conestoga-Rovers and Associates of Kitchener.

The study examined the feasibility of both a greenhouse operation and a salmonid hatchery for Great Lakes fishery stock.

At the same time, Ontario Hydro examined three possible heat extraction and delivery schemes from the two Bruce generating stations. Each of the schemes involves the delivery of the warm water to a header at the BNPD boundary at 914 g/cm^2 pressure. Each heat delivery system has been devised in conjunction with particular greenhouse growth scenarios. One delivery scheme involves modifications in the moderator heat exchanger to provide hot water (63°C) at a reduced flow of 58,400 L per minute. Ontario Hydro has indicated its willingness to undertake further research to achieve an ideal delivery scheme for warm water.

So far as reliability of heat supply is concerned, Ontario Hydro has determined that a survival temperature (7°C) within a greenhouse could be maintained with only one generating unit operating and outside air temperature at -18°C. Ontario Hydro estimates that three or more units may be unavailable for periods of up to 5.3 hours at Bruce A and for up to 2.5 hours at Bruce B, between December 1 and March 30. Two units at Bruce B, necessary for the higher temperature heat delivery scheme, could be simultaneously unavailable for about 2 per cent of the time.

Ontario Hydro developed a pricing schedule based on recovering the costs of heat extraction and delivery to the boundary of the site on a 1977 present-value basis over 30 years. The schedule includes provision for slow greenhouse growth during the development years. For starting acreages varying from four to 40 acres with growth rates varying from one to 10 acres per year, the initial cost per acre per year ranges from $4,800 to $10,667 with an increase of $1,000 per acre per year thereafter. The proposed schedules were prepared only for the Kincardine study and would require periodic review.

The Greenhouse Industry

The greenhouse industry in Ontario represents only 5 per cent of horticultural production and is declining as a result of rising fuel costs. The industry is concentrated in the Leamington area and the average grower owns less than one acre of greenhouse. The two major crops are tomatoes and cucumbers, which represent over 99 per cent of total production of greenhouse vegetables and in 1977 amounted to 10 million kg of tomatoes and 12,000,000 cucumbers.

Most existing greenhouses are oil-heated and are glass-covered. Production costs rose 64 per cent

between 1973 and 1977, three-quarters of the cost increase being a result of rising fuel costs. The gross return was less than 20 per cent throughout the period.

Imports of tomatoes and cucumbers from the U.S. and Mexico exceed domestic production by from 300 to 400 per cent and represent major competition to the industry. Since Canadian markets are on the end of the transportation system from the south, occasional gluts on major Canadian markets reduce prices well below domestic production costs. However, domestic growers produce a superior product, ripened on the vine, and a premium of 20 cents per pound is usually paid for higher quality. The result is a price, for tomatoes, which often ranges above $0.50 per pound during the winter season.

Ontario is well organized to export greenhouse products to other provinces, especially Quebec. A Greenhouse Vegetable Producers' Marketing Board assists in pricing and marketing.

In 1978, total Ontario tomato and cucumber imports were 411 million kg and 11 million kg, respectively. Tomato imports into Ontario are growing at roughly 10 per cent per year. A 400-acre (162 hectare) greenhouse development using moderator cooling water (within the range of capacity at Bruce) in a 12-month growing season could replace all of these imports. The gross return per acre would be $123,000 (or $304,000 per hectare), if the normal Canadian market price could be obtained. If only the Mexican price could be obtained, the gross return per acre would be $43,700 (or $108,000 per hectare).

In the first year of operations, it was estimated, a development within 0.75 km of the BNPD boundary, including costs for heat delivery, pipelines, pumping, maximum greenhouse costs, maintenance, production, and fixed costs and benefits, would show an expenditure of $83,500 per acre (or $206,000 per hectare) and could achieve $123,000 per acre (or $304,000 per hectare) in revenue. For the 30th year a cost of $517,700 per acre (or $1,278,000 per hectare) would be required (8 per cent escalation) to generate an expected revenue of $1,146,000 per acre (or $2,832,000 per hectare). Over the project life, it is calculated that a revenue of $66,680 per acre (or $165,000 per hectare) would be required for break-even operation.

The pilot project at Bruce requires heavy capital investment and is therefore extremely sensitive to higher interest rates. At the moment, the production season is shortened to avoid the coldest part of the winter. With abundant waste heat at low cost, the season could be extended throughout the winter and into the early summer, when field-grown tomatoes reach the market. Without a reliable, low-cost source of heat, the Ontario greenhouse industry faces a bleak future.

Site Selection

Greenhouses should be sited where light is reasonably intense, soil structure is suitable, climate is not too severe, topography is gentle, adequate flows of water are available for irrigation, and good drainage is available to allow the control of nutrients in the soil and to avoid salt buildup. Numerous suitable locations exist near the Bruce site. Water supplies are available from Lake Huron and drainage is good.

The principal obstacle is the abandoned Algonquin bluff, which requires that water be raised significantly from the lake and from the nuclear site to the potential greenhouse locations. The Bruce Nuclear Power Development is also surrounded by a restricted area within which human habitation is strictly controlled. It remains to be decided whether the greenhouse complex could be located within the restricted zone.

Employment Potential

Three people per acre would be the total manpower requirement. An initial development of 20 acres would require $6 million in capital investment and would employ about 50 non-owner, permanent workers, together with small numbers needed for packing and transportation.

Fish Production Using Waste Heat

Approximately 37 per cent of the people living in Ontario who were over 12 years of age participated in fishing in 1976. Anglers spend about $5.58 per angler per day, which indicates a total present benefit from the sport fishing industry in Lake Huron of $26,100,000 per year. A 5 per cent increase in benefits may be assumed as a result of the Bruce Fish Hatchery, indicating an increase in annual benefits of $1,958,000.

There is great promise in the restocking of the Great Lakes for commercial fishing, and restocking

from the Michigan side is currently going on. Commercial fish landings in Lake Huron declined from 16 million pounds per year in 1890 to 3 million pounds in 1970. Introduction of a self-producing salmonid species in Lake Huron could return commercial fishing to past production levels; annual net revenues could reach $5.2 million. Total benefits of a restocked salmonid fish population in Lake Huron could reach $7,158,000 per year.

Fish Hatchery

On the instruction of the Ontario Ministry of Natural Resources, a hatchery facility was investigated. An installation producing 45,500 kg of fish per year was used for investigation. The Ministry of Natural Resources indicated that two such installations would meet its current requirements. The long-range objective was the establishment of a self-producing splake population in Lake Huron and a resource programme that would produce benefits in the reconstitution of commercial fishing and sport fishing industries.

The main requirement is a warm-water supply to accelerate the growth of fish and a cold-water supply to maintain acceptable temperatures during the summer months. With proper control of water temperature, optimum fish growth can be obtained. The cold-water intake would need to be at or below 24 m in depth to meet the temperature requirement. The cold-water pipeline to the BNPD boundary would cost $5.3 million.

The overall cost of the hatchery would be $10,800,000. The employment potential would reach about 15 people at full production, for a capital cost per job of $270,000.

Fish Farms (for producing mature, marketable fish)

For each fish species there is an optimum temperature at which it will grow most rapidly. Canada's naturally cold waters reduce the efficiency with which food is converted to edible protein and therefore retard fish growth. In summer months, supplies of very cold water are necessary to maintain the optimum temperature.

Canadian fish farms supply a high-quality product; however, more than 900,000 kg of fish are still being imported into Canada each year. Rainbow trout is the most marketable and compatible species, with an optimum growth temperature of 18°C.

The government feasibility study explores production units of 45,500 and 227,000 kg per year. Current prices for rainbow trout vary from $3.52 to $4.40 per kilogram, depending on the type of packing and transportation.

Many of the components required for the hatchery could be incorporated in the fish farm and vice versa. The study estimated a capital cost of about $899,000 for a 45,500 kg facility. The 227,000 kg facility would cost $1,732,000.

Three or four full-time employees would be required for either facility. Capital investment per job created would be between $225,000 and $450,000.

The market potential is excellent. Between 680,000 and 910,000 kg of fish are currently imported each year into Canada; in addition, there is the local production of 450,000 kg. Growers believe that a large expansion into chain store food outlets is possible if supply can be made available.

"The use of condenser waters may be practical and would allow the technical development of a huge industry for the efficient production of fish protein," according to the study.

As a result of this study, a consortium of local investors has joined forces with the Weston group of companies to develop the pilot greenhouse project. If results are favourable, a major development could get under way within the next three years.

Summary

Agriculture

Between 1951 and 1976, the population on Ontario farms fell from 702,000 to 341,000, while the provincial population nearly doubled, from 4.5 million to 8.3 million. The number of farms fell from 150,000 to 89,000 and capital value per farm increased from $17,000 to $209,000. The farm value per acre of field crops increased from $47 in the 1950s to $163 in 1977. Farmland prices have risen by up to

1,000 per cent in the same period, driven higher by the need for additional acreage to justify larger farm equipment and by the use of foodland by urban people as a hedge against inflation. Rising urban incomes have encouraged a life-style that allows for a home in the country.

The rate of return on investment in full-time farming is very low. As a consequence, most farmers usually must have off-farm income at least equal to their farm income. Only 8,000 Ontario farms had sales of more than $75,000 in 1976, and were thus clearly capable of returning a full-time living to their owners.

Ontario agriculture produces 30 per cent of Canada's domestic food output on 16.8 million acres of land. Ontario has nearly half of Canada's 10 million acres of Class 1 cropland. It has been calculated that, at 1.0 acre per person and with a population of 30 million by the year 2000, Canada will need the equivalent of 30 million acres of Class 1 land. Canada has a total of 100 million acres of improved land, of which 69 million are currently cropped.

Canada and the U.S. together have 450 million acres of cropland. Estimating total North American population in the year 2000 at 280 million, it appears that there will be a comfortable margin of available farmland well into the next century. However, the rapid expansion in output per acre achieved over the last 25 years may be hard to maintain in the future. Air pollution, soil deterioration, the development of resistant pest and weed varieties, and the growing dependence of agriculture on fertilizer, pesticides, and energy may limit future gains per acre.

Canada may also have global responsibilities for food production, since it has 0.6 per cent of world population and 3 per cent of world cultivable land. It is likely that great demands will be placed on Canadian food output by the world market, since the conditions that led to widespread famine in the early 1970s have not basically changed.

Canada must safeguard agriculture in a number of ways. All elements in the food industry must be given incentives to produce more efficiently. Provision must be made for the preservation of foodlands, the development of more efficient supply, processing, and marketing industries, and better forecasting of trends in the world food industry.

The best lands of southern Ontario are also the most adaptable from an agricultural viewpoint. They produce the widest range of crops under variable climatic conditions and are suited to flexible, highly skilled management. Encroachment on these lands has occurred very rapidly.

Although the northern Ontario clay belt contains 6 million acres of Class 3 and 4 soils, climatic and drainage factors reduce the effective quality of the whole area to Class 4.

The Role of Ontario Hydro in Rural Ontario

Ontario Hydro's bulk transmission system traverses a distance of over 13,000 miles and its rights of way cover 200,000 acres of land. It is much more efficient to transmit power over higher-voltage than over lower-voltage lines. Farmers can cultivate lands under transmission lines, with the exception of the land covered by the bases of the towers, and Ontario Hydro maintains that its total use of Ontario foodland under towers and removed from cultivation amounts to only 2,000 or 3,000 acres. Nevertheless, Hydro's approach to the selection of generating sites and routes for transmission lines has been under constant attack by farmers, environmentalists, and owners of rural recreational and development lands. Public resistance has slowed the process of land acquisition and delayed the delivery of power to load centres. It can be assumed that all future route and site decisions must take public concerns into account.

Four criteria have been suggested for public participation in power planning:

- The reasons for certain decisions must be justified, taking into account the social costs of power generation and transmission.
- The state of knowledge of social effects, including the level of uncertainty, must be determined.
- The results must be amenable to critical examination by specialists.
- The results must be communicable to the people.

Ontario Hydro has worked closely with farm groups and scientists to develop an approach to classifying and ranking Ontario foodlands. The findings are being used in the preparation of alternative plans for generation site and route selection. Hydro argues that, to accommodate future power demand, a variety of options must be available in the form of alternative generation sites and routes. To accomplish this, Hydro has entered the field of land banking.

The presence of a hydro line appears not to affect property values in entirely rural areas. However, studies conducted northwest of Toronto, in the "urban shadow" zone of mixed agriculture and rural residential uses, indicate that property values may be reduced by from 23 to 30 per cent by the presence of a hydro line either on the property or within viewing distance.

Air pollution is steadily increasing in southwestern Ontario, largely as the result of industrialization in the midwestern United States. Severe damage has been noted in Kent, Essex, Norfolk, and Huron counties. No future fossil-fuel plants should be located in southwestern Ontario, to add further stress to an already overloaded atmosphere.

Ontario Hydro facilities should only be located:

- where land has low agricultural capability
- where transmission lines pass over as little foodland as possible
- on lands irreversibly transferred to non-agricultural uses
- to provide incentive for development away from foodlands
- where associated development will not encroach on foodlands
- where multiple-use corridors are established for the grouping together of line facilities (highways, pipelines)

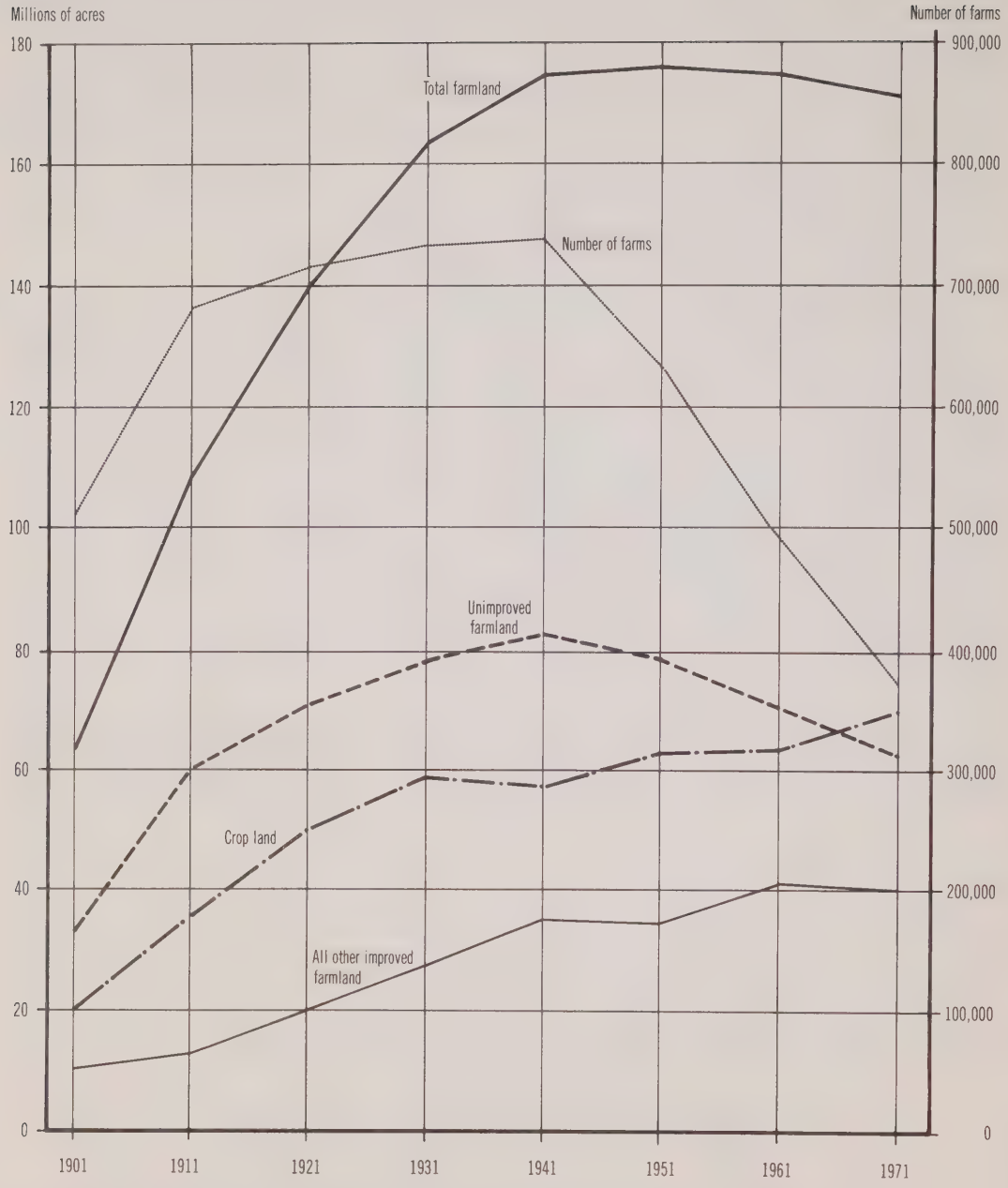
Ontario Hydro guidelines to minimize damage to foodlands should be followed scrupulously. Hydro is held responsible for retaining third-party mediators to resolve unsatisfied claims arising from acquisition of land and construction of towers.

Ontario agriculture is a heavy user of all forms of energy, including electricity. It is imperative that steps be taken to formulate an energy conservation programme for agriculture, to allow further increases in output per acre with lower increments of energy per acre. Research should be increased to find newer, high-yielding, short-maturing strains of crops, requiring little or no artificial drying.

Ontario Hydro now has sites available for the future production of an additional 52,000 MW of power, or triple the present demand on the system. Since land banking is a costly procedure, it does not appear reasonable for Hydro to acquire further lands for future use. If existing corridors can be upgraded from 115 to 500 kV it should not be necessary to acquire further corridor lands, with the possible exception of a corridor from Bruce to London.

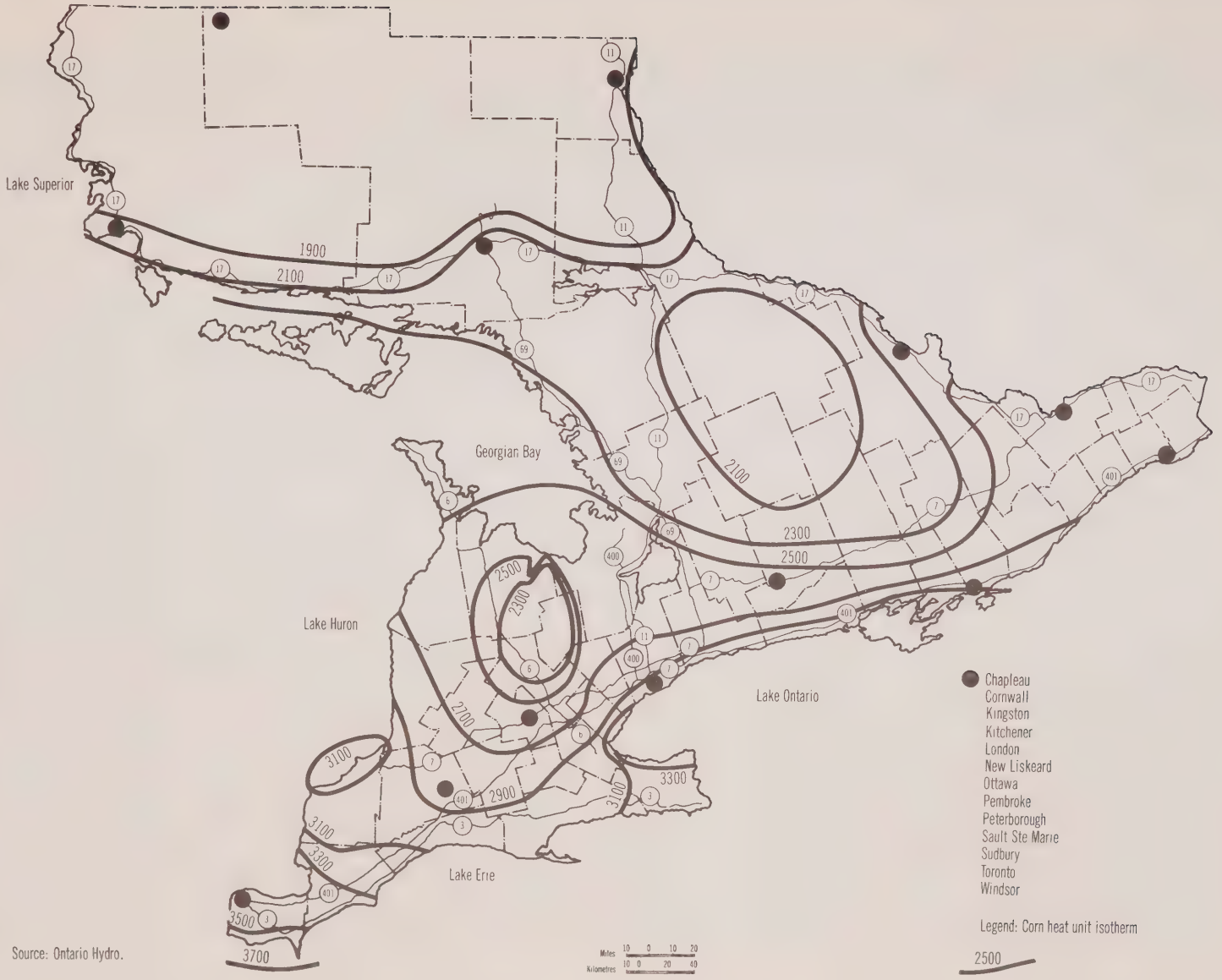
Waste heat from existing installations should be used for food production, provided that safeguards against radiation in the heated water can be made completely effective. It appears to be possible to double Canada's greenhouse capacity, using low-grade heat now vented into the Great Lakes system. Fish hatcheries appear to be feasible under similar conditions.

Figure 5.1 Canadian Farms and Farmland



Sources: Handbook of Agricultural Statistics, 1955, Catalogue 21-503; 1941 Census of Canada, Vol. 8 (1); 1971 Census of Canada, Catalogue 96-701.

Figure 5.2 Corn Heat Units



Source: Ontario Hydro.

APPENDIX A

The Bruce Nuclear Development

Bruce County's southern boundary is about 190 km northwest of Toronto. The county is about 225 km long, ranging in width from 11 km to 65 km. It contains just over 1 million acres, over half of it good foodland capable of producing over 90 different crops. It has hundreds of miles of beaches on both Lake Huron and Georgian Bay. Industrial growth has been confined to small plants based on timber and agricultural resources. Numerous water-power sites provided energy for grist and flour mills in the pioneer days, but when these were phased out most of the small industries based on agriculture disappeared as well. The population of the area began to decline in 1911 and continued to fall until about 1960. Wage levels were low, and the average income in the county remained below $3,000 per year until the early 1960s. The low cost of living made the area a mecca for retirement. Services in the villages and towns were rudimentary but adequate, although there was a shortage of services for the elderly and the handicapped.

Late in the 1950s, the area was chosen as the site for the experimental 200 MW Douglas Point reactor, to be constructed by Atomic Energy of Canada Limited. The site was chosen because rock was close to the surface, there was an abundance of cooling water, and centres of population were far away. Output of the plant could be absorbed into the existing hydro grid in the region.

In 1959, Ontario Hydro purchased additional land and by 1969 began detailed planning for the Bruce A Nuclear Generating Station, to consist of four 750 MW reactors. By 1970, about 500 men had moved into the area, settling on farms, in the towns of Port Elgin and Kincardine, and in the nearby villages of Tiverton, Paisley, and Southampton. Hydro built a spur rail line and new access roads to the site and began construction. At about the same time, Hydro made the decision to build four heavy-water plants near the same site and acquired land both for these plants and for the future Bruce B Generating Station, a duplicate of Bruce A.

In the late 1960s, the town of Port Elgin undertook the preparation of a master plan for future development. Despite extensive effort, the consultants for the town were unable to obtain information from Ontario Hydro with respect to future development plans. As a result, the Port Elgin plan was developed in the expectation of limited growth, and provided for very modest expansion of services and facilities beyond the needs of the 1,800 residents living there at the time.

During the early 1970s, the flow of Ontario Hydro executives and workers into the area swelled to a flood. Suitable development land had been acquired by developers from outside the area, and even from outside the province, who seemed to know more about Hydro's future plans than anyone in Ontario. As a result of the burgeoning population of Hydro employees, the Town Council of Port Elgin became, almost overnight, a Hydro employees council. It began rapid development of the town, to provide homes and services for Hydro employees. Kincardine Town Council followed suit, as did other local municipal councils. Capital expenditures by the Town of Port Elgin alone rose from $169,000 in 1972 to $1,397,000 in 1977, and to over $1,300,000 in 1978. The population of Port Elgin rose from 1,800 in 1969 to about 6,000 in 1978. At the same time, the rural townships of Saugeen, Bruce, and Huron expanded dramatically, as Hydro employees took over farms (at high prices) and severed lots for country homes, to provide living space for themselves. An article by the Owen Sound Sun Times, dated November 3, 1979, alleges that Ontario Hydro falsified its capital investment intentions when applying to the Township of Bruce for building permits. In this way, it misled local bodies as to its intentions, and saved itself $6 million in building permit fees on the Bruce B complex alone.

By the middle of 1978, 8,500 Ontario Hydro workers were employed at the Bruce complex. Of this number, fewer than 2,000 lived in temporary accommodation at the site. The remainder, with their families, generated work in the area for a further estimated 10,000 people.

Ontario Hydro staff are well paid. The average construction salary at the site in 1978 was $25,064, while the average operations salary was $24,180. The combined gross weekly payroll was $3,205,280. Of this total, nearly $2 million per week consisted of construction payroll. When construction is concluded in 1986, this payroll and its multiplier effect will be lost to the region.

The total effect of the construction project has not been calculated. Ontario Hydro commissioned a study by M.M. Dillon in 1974, to estimate the probable social and economic impact of the project, but this study has not been updated and it is now clear that it underestimated many of the local costs. For example, it

estimated that municipal capital spending by all communities would be about $2.5 million to provide new sewers, water systems, schools, roads, and other basic services for the expanded communities in the area during the construction period. Port Elgin alone spent $2.7 million in 1977 and 1978 for capital construction. No estimate of private investment was attempted.

Town by town population changes forecast by the Dillon report are given in Table A.1.

Table A.1 Population Changes

	1970	1978	1984
Kincardine	2600	6000	3800
Port Elgin	2000	7000	4100
Southampton	1800	3100	2100
Walkerton	4200	5600	5200
Paisley	750	1600	900
Bruce	1200	2200	1700
Kincardine Township	1500	3700	2500
Saugeen Township	800	1700	1200

Source: M.M. Dillion: "Bruce Nuclear Power Development – Community Impact." prepared for Ontario Hydro, September 1974.

The Dillon report estimated that the gross economic cost of building and maintaining required services for these communities (the total impact before tax payments by new residents was deducted) would be $5.5 million to 1978 and $9.6 million between 1978 and 1984. This impact will be especially harsh because of the disappearance from the tax roll of local businesses that are unable to pay Ontario Hydro wage rates and are forced to close. In addition, Ontario Hydro does not pay taxes on its assessment but pays a much lower grant in lieu of taxes. Farms and homes within a five mile radius of the complex are being purchased and removed from Bruce Township tax rolls. The township is therefore facing heavy costs and receiving little revenue. A further factor will be the heavy burden of taxation resulting from the unpaid portion of debentures applying to new facilities, the cost of operation of overscale systems, buildings, and equipment, and the social impact of falling house prices.

Norman Pearson, a planner from London, Ontario, conducted a study at about the same time as Dillon that estimated gross impacts on local communities of $24 million. Pearson pointed out that the local communities, having no industrial tax base, are uniquely dependent on the property tax base. As Pearson put it:

> For a long period, the area was relatively static with slow growth, which was capable of being dealt with within the existing structure because the change was limited and required relatively modest additions to infrastructure. Development was generally under municipal control, permitting the growth rate to be related to the financial strength of the municipalities and generating only a limited inter-generation debt which could be readily serviced. The municipalities now face a serious adverse impact in which the growth rate is beyond their control because it is generated by a massive public investment, in which there is no compensating industrial-commercial assessment growth to balance the greatly increased residential impact, and in which they must drastically and immediately increase their infrastructure without any preparatory period, simply to catch up with the growth pressures already occurring.[1]

The Dillon report forecast the following socio-economic impacts, in order of importance:

- shortages of affordable labour for local businesses and municipalities
- substantial increases and then declines in housing prices
- demand by Ontario Hydro employees for a much higher level of community services
- major work-load increase for municipal employees and representatives
- major expansion of physical infrastructure (roads, services, etc.)
- need to regulate new forms of development (mobile homes, apartments)
- lack of municipal borrowing capacity to finance necessary capital works
- inability to attract new industry
- severe land speculation leading to hardship
- social problems and major increase in criminal activity
- shortage of tourist accommodation
- change in character of the communities in the area.[2]

In addition, the Dillon report forecast major financial and social-service problems after the project began to wind down in 1978. Not only would costs of new facilities weigh heavily on the smaller

population remaining behind, but falling house and real estate prices would lead to a variety of anti-social behaviour.

The period since 1974 has seen most communities within the impact area move to a position of almost total dependency on the Ontario Hydro construction project. Not only has decision-making been largely taken over at the municipal level by Hydro employees, but the power of the Hydro payroll has dominated every major decision in the area, public or private, since 1974. Recent farm income information for the county shows that of 4,125 farmers who filed taxes in 1976, 3,870 worked off the farm. Net income from farming operations averaged $2,247 per farmer, while off-farm incomes averaged $8,636. Net farm income, therefore, appears to make up about 26 per cent of the total income of tax-paying farmers in the county. The construction of the nuclear complex has provided much of the other 74 per cent.

Beginning in mid 1978, the construction labour force began to diminish from the peak of 8,500 men reached in the spring of 1978. It fell, by late 1979, to about 6,000 men and will fall again in 1982. By 1985, the Bruce complex will be essentially complete. Of the 8,500 men, few will remain. A total of 2,000 to 3,000 operating engineers, nuclear technicians, and others, most of them with advanced training, will continue to live in or will be moved into the area. Obviously, this labour force will not come from Bruce County, where such training is unavailable, but will be brought in from outside. The local labour force will be reduced to a few sweepers, cleaners, and maintenance personnel.

While this winding-down process was taking place, the towns continued to open up new subdivisions, and to issue permits for new homes and apartment buildings. The mayor of Port Elgin and the former mayor, both Ontario Hydro employees, were, until recently, recommending additional annexation, development, and construction to accommodate a target population of 12,900 by the late 1980s. At the same time, population projections included in the Saugeen District Official Plan, the Dillon study, the 1975 Port Elgin Annexation Study, and the South Bruce Official Plan, all call for populations in the 4,100 range for Port Elgin and for Kincardine.

Mitigating the Impact of the Bruce Nuclear Plant

A variety of approaches to the problem of socio-economic impact have been taken in other jurisdictions and these provide some indication of the steps that might be taken by Ontario Hydro.

The Tennessee Valley Authority (TVA), which is a public utility of about the same size as Ontario Hydro, has built a number of nuclear plants of the scale of Bruce A and Bruce B near small communities in the southern United States. The TVA begins the process of site selection by recognizing that severe socio-economic impacts may result from large projects, particularly in rural areas. Sites that are otherwise suitable are examined carefully to determine whether it will be possible to accomplish the construction activity without disrupting the life-style in the area or increasing the long-term burden of debt. Where there is little prospect of sustained economic growth, the TVA uses a "construction-camp" approach to minimize external impact on permanent communities. As part of its licensing procedure, the TVA is required to monitor continuously the socio-economic effects of its construction programme and to mitigate these effects by modifying its construction plans or altering the schedules, or by making direct payments to affected municipalities. Mitigation expenditures pay for all additional infrastructure costs, including education, transportation, social services, housing, and planning.

In the Bruce County area, Ontario Hydro for several years paid special annual grants of $100,000 to the county, which distributed the money on the basis of the number of Hydro employees in each jurisdiction using the services. These payments have been increasing in recent years, and in 1978 and 1979 community impacts grants of about $750,000 were paid to the county. In addition, Hydro pays grants in lieu of taxes for the property on which the Bruce complex is situated. These grants amount to just over $100,000 each year instead of the millions of dollars in taxes which such massive investment would normally generate.

Special grants of $250,000 have been paid to Port Elgin and Kincardine to cover costs directly related to the needs of Ontario Hydro employees. Because of the enormous increase in truck traffic between local gravel pits and the nuclear site and because much of the commuter traffic in the area is generated by Hydro employees, a total of $4,105,600 has been invested in road construction and maintenance, nearly all of it for paved highways dedicated to the site.

Grants related to socio-economic impacts on the area (not including road improvements) amount to over $5.5 million to date.

TVA spokesmen confirmed that a four-unit, 3,200 MW complex of the Bruce A type, requiring about 4,000 workmen, would generate external costs to local municipalities of about $12 million, and a development of the scale of Bruce A and B together would cost about $24 million, neglecting the value of the heavy water plants. The TVA would, during the period of construction and the following adjustment period, expect to make payments to affected municipalities of about this amount. Alternatively, if there was a reasonable prospect of sustained and soundly based economic growth, TVA would provide assistance to the communities to locate suitable industries and would provide low-cost power to them as an inducement.

It appears that Ontario Hydro, with over 8,000 men at Bruce, has obtained a remarkable bargain at the expense of local municipalities, especially if a reduced population is left with the final payment of debentures maturing in the late 1980s and 1990s. To date, the Government of Ontario has taken no action on behalf of local municipalities.

Ontario Hydro is, however, apparently moving towards an approach similar to the one used by the TVA for future sites. An agreement has been signed with the Town of Newcastle, which expects to be affected by the construction of the Darlington nuclear plant. Although Newcastle is a town of 30,000 and is close enough to Toronto for workers to commute, the municipal leaders of Newcastle expect the unplanned impact of having 4,000 workers in the area for a period of five to eight years to be significant. Hydro has therefore agreed to compensate the town for "all financial impacts which result from the construction and operation of the Station including financial impacts resulting from any reduction in population in the Town of Newcastle due to the completion of construction of the Station and emigration of workers from the Town of Newcastle".[3]

In addition, Ontario Hydro has agreed to mitigate all impacts related to the cost of advancing community facilities, integrating temporary workers into permanent communities, developing an infrastructure, preparing and managing a development strategy and growth management programme for the town, and to other unforeseen costs that may arise from time to time.

APPENDIX B

The Nanticoke Coal Station

Throughout the RCEPP hearings, there has been discussion of "Ontario Hydro's role in provincial planning". Numerous witnesses have argued that the siting of power plants can be an important factor in site selection by industry and some have suggested the development of "energy parks". Such parks would centre on a major power facility, usually nuclear, and would include a range of small and large industries on a scale that would sustain a new city. Ontario Hydro has argued that under present circumstances, with equalized power costs across the province, there is little or no connection between power-site planning decisions and industrial location decisions.

The Nanticoke case is especially useful for analysis of this point, since it is often cited as an example of an energy park and the growing concentration of industry in the Nanticoke area is cited as proof of the potential synergistic effect of a large power plant. Extensive information presented to the Commission seems to show that such concentration is by no means an automatic process and that the Nanticoke site may have been chosen simultaneously, and for many of the same reasons, by a large steel company, a large petroleum refiner, and Ontario Hydro.

Nanticoke offered good rock foundations; a suitable harbour site; raw material availability (coal, limestone, oil, and gas); a superb transportation network, including competitive ship, rail, and highway systems; proximity to load centres and markets; a potential for future expansion; and abundant cooling water.

But perhaps the most important consideration for the industries involved was the fact that Nanticoke lies within the "Great Lakes Megalopolis", which is developing in a vast area from Quebec City to Chicago, including the perimeters of lakes Ontario and Erie and the lower halves of lakes Huron and Michigan. Norman Pearson and others have pointed to the immense international significance of the growth of this industrial area, which now has "in terms of locational advantages and transportation facilities... the greatest comparative advantage in North America".[1] These advantages are worth setting out, for they are the key to the industrial and urban pattern:

- The Nanticoke area lies at the heartland of North America with direct access to the ocean via the St. Lawrence Seaway.
- The main east-west transport routes of the U.S. pass through the area.
- The area is directly linked to the Gulf of Mexico via the Mississippi Corridor.
- Nanticoke thus offers maximum market penetration and interaction at least cost.[2]

Because of the strategic location, Stelco, Dofasco, and Texaco began identifying suitable sites for expansion in the mid 1960s, probably before Ontario Hydro. All reached similar conclusions, although the Dofasco site is many miles from Nanticoke and the power source. Stelco, working on a long-range plan to double production by the mid 1980s, had by 1969 acquired 6,600 acres in the Nanticoke area; Dofasco purchased 5,000 acres in the Port Burwell area; Ontario Hydro purchased 768 acres and Texaco 1,310 acres, both at Nanticoke.

Facilities capable of producing 11 million tonnes of steel annually were proposed by the steel companies; a 2,200 MW power plant was proposed by Ontario Hydro, and a 50,000-barrels-per-day refinery by Texaco. Taken together, it was estimated that development over the 30-year period beginning in 1970 would result in a population increase of 350,000 in the area by the year 2000. This implied the need for a major new city capable of dealing with the bulk of this growth and of reinforcing the surrounding communities.

All of the plans included substantial allowances for expansion, including an industrial park as the site for secondary manufacturing and service industries that could benefit from proximity to electricity, steel, and petroleum products. A future petrochemical complex was envisioned. By 1970, an industrial complex of 30,000 acres was assembled, designed to meet the needs of industry for at least 30 years. From this prospect emerged the concept of the energy park and the idea that, if it was feasible at Nanticoke, it might also be feasible at Edwardsburgh, Bruce, or on the North Channel, where power or industrial sites had been identified.

Elaborate planning continued through the past decade, resulting in a plan to build a new city (Townsend) which could reach the size of the city of London.[3] The Haldimand-Norfolk Region was created as a super-municipality that could plan the development. A detailed growth strategy was

mapped out for the area, beginning with the expansion and improvement of services in existing communities and the construction of a regional water supply system. Industrial development was to be confined to the area immediately to the east of the Ontario Hydro and Texaco sites, to conserve valuable agricultural land. Detailed plans were drawn up for regional economic diversification – "nodalized decentralization of urban growth which avoids unsightly and uneconomic sprawl or strip linear development but builds upon existing centres' capacity for growth"; a transportation system that would "shape the pattern of future urban growth as a deliberate instrument of long-term development policy"; environmental measures to provide services while protecting recreational lands and foodlands; and "a pattern of partnership in planning, which encourages local participation in each stage of the planning process and ensures that resulting action programmes reflect an amalgam of local, municipal, county, regional, and provincial viewpoints".[4]

A compact, 14,000-acre townsite was chosen, within easy reach of the industrial area, away from environmental hazards, located so as to have minimal environmental and ecological impact, near existing settlements in the area, connected to the main regional transportation, communication, and utility corridors, and in a pleasant landscape where recreational opportunities were abundant. The province then acquired the chosen site and, for reasons which remain obscure, acquired a second site near the town of Jarvis (South Cayuga).

It is expected that the new community will be highly dependent on existing centres until it reaches a "take-off" population of about 20,000. At that point, it is expected to begin to pull in urban services and facilities beyond the scope of existing towns and villages, and as it grows it should increasingly support its own employment base in services and institutional facilities. The creation of a new town, rather than an effort to expand existing towns, was justified because, as Pearson put it:

> Trying to cope with rapid growth for a sustained period in the small settlements of this surrounding region in the prevalent Ontario circumstances would undoubtedly wreck the essential qualities of these places and fail to meet the needs of the incoming population. It would also result in a very disadvantageous impact on the agriculture, recreation and conservation resources of the region.[5]

Whether the elaborate plans for Townsend will be realized on schedule is still far from clear. Weak markets for steel and refined petroleum products and recurrent problems with the Nanticoke power station have meant that fewer workers than expected have chosen to move to the area. To date, growth has been in the surrounding communities of Tillsonburg, Jarvis, and Cayuga, and little development has begun at Townsend. Whether the growth to the size of a major city will take place in the smooth and virtually automatic manner described by the planners will not be known for at least 10 and perhaps 20 years. It is possible that Townsend, along with the Pickering Airport and the Edwardsburgh Industrial Park, will be numbered among Ontario's white elephants.

It is clear that joint development of the kind that took place at Nanticoke leads to opportunities for improved transportation infrastructure, joint use of cooling water and water supply facilities, joint harbour works and dockage facilities, joint development of community infrastructure, and the timing of construction of various plants so that labour-force growth and decline can be minimized.

The disadvantages of joint development have generally been air pollution around a fossil-fuel plant; inhibitions related to development near a nuclear plant; long distances from major load or market centres; and a sequence of socio-economic impacts far out of scale with adjacent regions, which affect foodland use, wage rates, and housing costs over a wide area.

With respect to the prospects for energy parks at other sites, Pearson concludes that:

1. Site criteria for large energy projects are very similar to those for heavy industry, but heavy industry and urbanization relate much more closely to urban corridors and areas of market advantage.
2. Ontario Hydro projects in key areas such as the Detroit-Toronto-Montreal corridor could easily be located directly on locations which are of international market significance for industry.
3. In areas which are actually or potentially key water transport sites, on the Upper Lakes, Ontario Hydro could help touch off a regional development process by joint development provided that basic future potential location factors exist and can be drawn into operation at realistic economic levels.
4. Ontario Hydro projects in areas away from the Corridor and not in potential urban-industrial locations may have no discernable effect.[6]

APPENDIX C

The Concept of a Combined Energy Centre

Throughout the RCEPP hearings Ontario Hydro has expressed the view that there has been no tendency for industries to locate near power plants because of the availability of abundant power. Where large industries have located nearby, as at Nanticoke, Hydro spokesmen argued, the decisions were made on the basis of available harbour facilities, cooling water, transportation corridors, raw materials, etc. As long as power rates are standardized across the province, there is no incentive to locate close to power plants.

At the same time, various ministries in the Ontario government have expressed the view that "energy parks" or "combined energy centres" might be a feasible method of decentralizing industry out of the Golden Horseshoe. Some industries and municipalities seem to share this view. The large industrial park was developed at Nanticoke, presumably to provide sites for industries attracted to the area by the proximity to power, steel, fuel, and transportation. When the Ontario government assembled a tract of land at Edwardsburgh, near Prescott, there was discussion about the need for a large power plant nearby as a catalyst to generate development.

In late 1976, a group led by the Strategic Planning Branch staff in the Ministry of Industry and Tourism produced a report entitled: "The Concept of a Combined Energy Centre in Ontario".[1]

The report was the product of a committee formed in 1974 by Industry and Tourism, Energy, TEIGA, Resources, and Environment. The committee discussed with a scientific-technical group, including industry leaders, Ontario Hydro officials, and government representatives, the various forms an energy centre might take. The Ontario Cabinet decided that the matter warranted further study, and it provided funding.

> The consensus seems to be that it is an important new initiative which could have ramifications of great importance to the Ministry, the Province, industry and the people generally, and would provide a new approach in order to develop industry, to create regional activity and to help offset problems now facing manufacturing and business in the Province. As well, it could become a major step forward in areas related to improved environment, culture, labour relations and other aspects of "quality of life".[2]

The report stated that:

> Industries no longer find Ontario to be the best place to locate a plant. Their attitudes are influenced by interprovincial debates, national socialistic [*sic*] policies, high tax levels relative to other locations, concern over the energy supply in Ontario and decreased productivity compared with other possible locations.[3]

The report went on to define a Combined Energy Centre as "a combination of extensive industrial installations, new agriculture and aquaculture production facilities, a new 'town of the future', new tourist facilities".[4] All of these would be built within the area of influence of a new power plant, would use waste or reject heat from the plant, and would interchange materials, labour, and products between agriculture and industry.

The proposed new town would incorporate advanced architectural features to take into account the climate, the environment, and the site, and would incorporate advanced communication facilities and new forms of recreation facilities to take advantage of the site, the environment, and the availability of inexpensive heat (ranging from all outdoor activities to indoor sports based on the free heat source). It would include a full range of cultural facilities, including libraries, theatres, art and craft centres, facilities for senior citizens, an advanced education centre including a community college, and advanced forms of transportation including electric cars and buses and pneumatic waste-collection vehicles.

The report said: "All the above, taking optimum advantage of the natural beauty of the surrounding countryside, would create a quality of life not available elsewhere in Canada and should have appeal to environmentalists, pollution sensitive groups and labour."[5]

The site for the centre would be chosen so as to avoid prime agricultural lands, and it would be in a part of the province where industrial growth is needed. Location considerations listed in the report include proximity to rail, highway, air, and sea transportation; ready access to Canadian and U.S. markets; access to gas, oil and slurry pipelines; availability of large quantities of cold fresh water; a large land

area to serve as a land bank or to be controlled as a "development region"; room for industrial expansion; and an area "amenable to benefit from a measure of climatic and environmental control".

A suitable site, it was suggested, might be in the Blind River-Thessalon area, where Sault Ste. Marie, Elliot Lake, Sudbury, and North Bay could provide the labour base for a self-generating growth area.

To support the concept, the report listed a number of key problems that need to be resolved. Among them were:

- Very large expenditures on new plants will be made by Ontario Hydro in the near future. One of these plants will probably be in the North Channel area. Such new plants will require infrastructure, townsite, roads, ports, communities, and all amenities.
- Lead times for the development of a new town, new industries and a new nuclear plant are all about the same – normally 12 years.
- Good agricultural land is being gobbled up by such plants and by industry.
- The number of new dwellings in Ontario is expected to double in the next 20 years.
- Agriculture and aquaculture could help to supply the growing demand for food in Ontario, and reduce provincial dependence on imports.
- Industry needs cheap power in order to be able to compete.[6]

The report proposed that the committee, led by the Ministry of Industry and Tourism, Strategic Planning Branch, would co-ordinate long-range planning for the project, with assistance from other ministries, Ontario Hydro, Atomic Energy of Canada Limited, the Special Committee for Elliot Lake and the North Shore, Central Mortgage and Housing Corporation, the universities, and any necessary consultants.

It was suggested that suitable industries might be found among users of large amounts of energy (steel, aluminum, abrasives); users of waste heat (agriculture, aquaculture); companies with interrelated by-products (petroleum, plastic); and labour-intensive companies (government offices, insurance, education, Ontario Hydro).

To spur the development, after a suitable site was selected, the Committee urged the use of government incentives, including lower rates of taxation, investment credits, rapid write-offs, long-term agreements, and pressures in large existing communities to slow the rate of growth and force industry out to such centres.

In the winter of 1977-8, the firm of Bovis-McNamara was hired to undertake a preliminary assessment of the site suitability of a combined energy centre for northeastern Ontario's North Channel. The report, submitted in 1978, made the following recommendations:

> That further study of a Combined Energy Centre in conjunction with a North Channel generation station merits investigation to develop the concept into a workable regional plan.
>
> The steps in the concept development would be as follows:
>
> 1. to define the Combined Energy Centre site with reference to the area's usability and restraints,
>
> 2. to define the activities and industries that could fit into such a regional development, socially, environmentally and economically,
>
> 3. to estimate costs and benefits and to define management and funding.
>
> Existing studies are numerous and should be brought together into a Development Plan for the next 20 or 25 year period.
>
> The growth region should include not only the area immediately surrounding the proposed generating station, but the Elliot Lake mining townsite and district plus smaller settlements and industry between Sudbury and the Sault and might include these two centres in the development.[7] Due to inflation alone, world costs of oil will rise to nearly $100 a barrel by the year 2000 (based on a 7 per cent inflation rate and a current price of $25 per barrel in 1980 dollars). The availability of bulk power and abundant steam and waste heat, with minimum charges for the transportation of the energy, may provide industries with a strong incentive to move to such centres.

It is the view of this writer that Bruce is obviously the place to test the idea, since the energy is available, the towns are already expanded, and the labour force has been assembled to begin such a project. The province should move quickly to develop a major industrial park at Bruce to test the viability of the combined energy centre concept.

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